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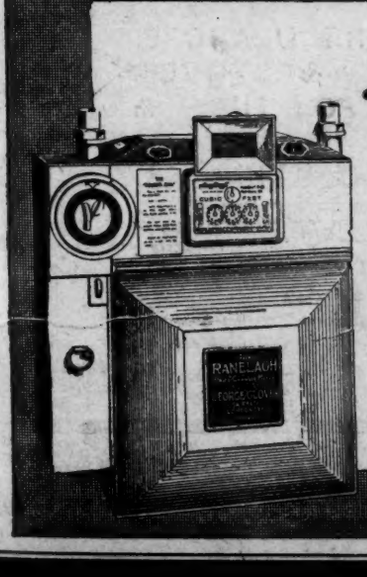

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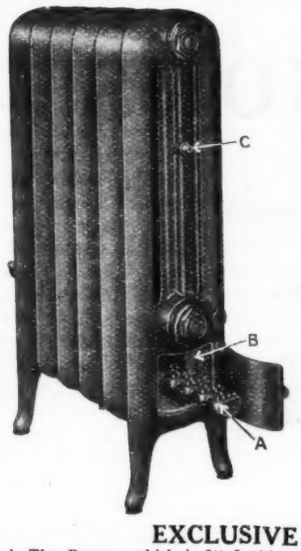

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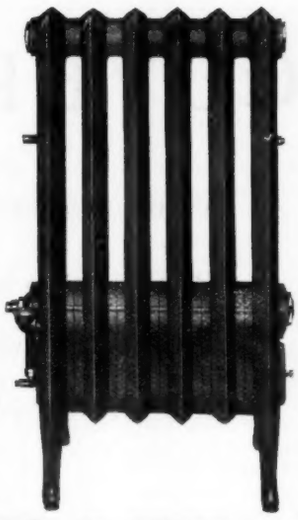

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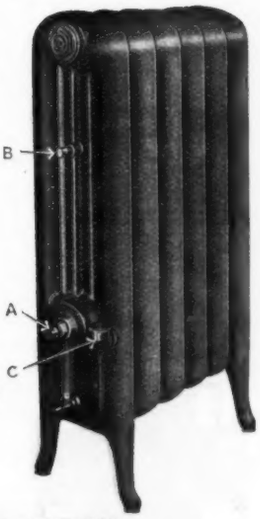

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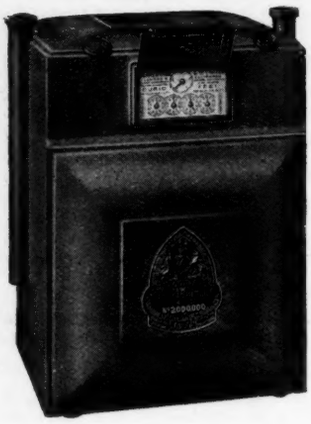

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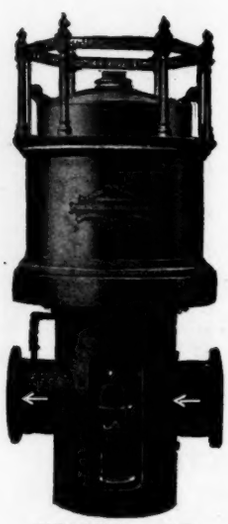

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VOL. CLXXIII., No. 3272.] WEDNESDAY, JANUARY 27, 1926. [78TH YEAR.

EDITORIAL NOTES.

Gas Policy—Interest Awakened.

PRIVATE correspondents and visitors to the "JOURNAL" offices have referred to the editorial article which appeared on Dec. 9 under the heading, "Does the Gas Industry Need Overhauling?" and to subsequent ones on Jan. 13 and 20, which suggested that a "looking-forward" policy is much required in the industry. There is a proneness in some quarters to deal only with gas matters as they arise, and not to look sufficiently ahead. Such "looking ahead" as there is is mostly confined to the provision of plant for gas production based on the experiences of immediate past years. In respect, however, of the fundamentals which apply to expansion and protection of interests in the important time that lies before us (in which we hope to do so much, but in the preparation for which some are doing so little), there is a lamentable dearth of imagination and vision. Many professional gas men agree with us; but, unfortunately, those who agree do not hold the purse-strings of the industry, or of their own undertakings, and cannot individually do much to influence the establishing of a policy founded upon circumspection and vision, which will develop and defend the interests of gas in the future. Among our visitors during the week has been a substantial gas shareholder whose errand had much the same purpose as had communications over the telephone—assistance in settling a doubt as to whether, not being fully conversant with the facts, it would be a good thing to sell out gas holdings in view of the resolve of the Government to do something, in their belief, to promote the development of the electricity industry—to the disadvantage of gas. That, we incline to think, is symptomatic of what exists to a widespread extent. If it exists, if there is uncertainty in the lay minds, it must be suppressed as quickly as possible; and suppression is not to be secured only by opposition to the Government taking up a preferential attitude towards electricity on distinctly false premises—with the issues of their proposals steeped in doubt. It requires a constructive policy to be put forward by the gas industry which will show beyond any question that it has in hand a counter-active scheme, and one the very constituents of which will be protective of the development and the material interests of gas undertakings in the years ahead—a scheme not of a revolutionary, but of an evolutionary kind. That will give confidence; and confidence there must be, for the capital-raising power of the industry must in these times be maintained unimpaired.

Let there be no mistake; we are not advocating anything which suggests a policy prompted by fear. What we feel is that the time is supremely opportune for a programme constituting a constructive policy, which will evidence the fact that the gas industry is able from its own innate ability, without Government aid, to produce a policy which will be in every respect the counterpart of, or something better than, that the Government are producing for electricity, and which will be founded on circumspection and foresight. One who is well behind the parliamentary scenes tells us that, however strong opposition may develop to the electricity scheme, the Government will carry through something in this coming session of Parliament. While we may have fairly well-placed doubts as to anything efficacious issuing from the plans, they are only doubts which can be justified by present knowledge and considerations, and do not possess any positive qualification. Without absolute certainty, the gas industry cannot oppose the constructive (as it is politically hoped they are) plans of the Government; for the industry would be met immediately with the argument that anything which will be of national advantage must be carried out, and the argument might be further extended to show that anything which will be of national advantage industrially will be of benefit to the gas undertakings of the country. That being the position, then all the more necessity for the gas industry (while protesting against preferential parliamentary consideration for its business rivals, and strongly opposing financial support from national funds) to show, by internal action, its own potentiality, and to start-off on a career of development on its own account, by strengthening its position by all available means, and by getting early possession of new fields which may not be striking at the moment, but will be valuable in the future. It will be little use going to them when they have been occupied and cultivated by the electrical rivals under the Government scheme. *We must legislate now for the future.*

There are many items which can be brought into a constructive gas policy. We have frequently spoken of the advantage which high-pressure transmission of gas has given in enabling the roping-in of outlying rural areas, and in supplying gas in bulk to small gas undertakings the manufacturing efficiency of which is not that of the better circumstanced gas-works a distance away. In our "Correspondence" columns to-day, Mr. W. R. Herring deals with this question, which is a powerful point in respect of future development, and would place the gas industry on an equality with the electricity industry under the Government scheme. Our correspondent urges the taking-in of virgin areas by cross-country transmission, and the wiping-out of inefficient works by bulk supply, either by absorption or by the sale of gas to the present small undertakings. Why should not the gas industry—by every one of the larger gas undertakings doing its part, and by every medium-size undertaking becoming larger—put a "gas grid" all over the country in precisely the same way that the Government are proposing shall be done by the electricity industry? It is for the larger undertakings and for the medium-sized ones in good central positions to consider what (if any) contribution they can make to this condition. Another thing is inter-linking between undertakings, so as to diminish capital expenditure on stand-by plant, and to be able readily to assist each other in times of emergency or at plant reconstruction periods. Imagination and vision are wanted, and not the fear of making a politic expenditure of capital which will serve to protect an undertaking in the time to come. In this connection there is a striking passage in Mr. Herring's letter in which he asks gas administrators not to forget that the concern they govern is a trading one, and that it is expected to take risks in anticipation of profits; also they should not forget "the action of their forbears, who, being men of courage and resource, did in the first instance risk their capital in a venture that was by no means at that time as certain of success as what to-day lies within the reach of many undertakings in the form of stretching outwards to

country areas and near-by villages where gas consumption can be started on a scale as large to-day as a century ago many of our large undertakings had their beginning." The presence of supplies of gas, or cheaper supplies than exist at present, would do much to develop village industries and the attractions of rural areas. Further: "Unless the gas industry is to be confined to its present restricted areas, it is of supreme importance that advantage should be taken of the present circumstances to see that any privileges for wider distribution of electricity are made common to the gas industry, and that no restrictions shall be imposed to the disadvantage of the latter industry upon the exploitation of areas falling within the electrical 'grid.'" There is agreement to the full with our correspondent.

We are confident that the reply to the Government electricity proposals rests in constructive action on the part of the gas industry—not only in respect of carrying (through the more economic means now available) gas supply to areas of the country not yet supplied, and developing bulk supply business in areas served by small inefficient plants, but by a policy which includes (say) a two-part tariff, maintenance and good service on the consumer's premises, and the production of secondary products in a condition which consumers require, and not in that condition which traditional practices yield. But who will take the initiative in preparing a scheme embodying a broad policy, having in view future business development, and the protection of the interests (both existent and latent) of the industry? Let a few earnest, far-seeing men get together, prepare a scheme, and submit it to the Central Board of the National Gas Council for (if thought fit) their adoption and furtherance. If we except the force of circumstances, no one but the Government can compel the acceptance of any policy by those directing a gas undertaking. But an authoritative statement of advisable policy can do much by influence, suggestion, and advocacy. The gas industry must help itself in the light of new circumstances, and having regard to the future. If any gas undertakings refuse to do so, then the consequences in the time to come will be on the heads of their purblind administrators. If the Government electricity scheme only enlarges the horizon of the gas industry in respect of the future, it will have rendered inestimable public service.

The Government Electricity Scheme.

THE intentions of the Government—good natured no doubt—to show the electricity industry the way it should go to obtain development, and to give to the country an improved and cheapened service, are not being received with anything like unanimous approval by the industry itself. The division of electrical opinion is becoming more emphatic and acute. Some of our electrical friends have swallowed at a gulp the picturesque outline made by the Premier of the plans as being the one and only means of enabling the industry to expand geographically and quantitatively in its operations; others have at once detected the weakness and shallowness of the foundations on which the scheme is constructed, and are fully persuaded that there will be grave disappointment in the result. At the moment, there is little which can be added to the comments in last week's "JOURNAL;" there will no doubt be more to be said when the Bill in finished form is laid before the House. The National Gas Council and the Gas Companies' Protection Association are watching carefully with the view of ensuring that, should there be the necessity, fresh action shall be taken in the attempt to safeguard the interests of the gas industry. On Friday of last week there was a conference between the Minister of Transport and representatives of the two gas organizations mentioned. The deputation was a strong and representative one, as will be seen by the list of names published on a later page. But what transpired is, of course, a matter of privacy, and the expressed desire of the Minister that it should be so must be faithfully observed. After all that has been said and done, the Government cannot fail (if temporarily it had escaped from mind) once more to remember that the gas industry is a national public utility—indispensable, and rendering important service of a manifold nature, which cannot be superseded by any other industry.

However, further information regarding the scheme has been published in the electrical journals, which were privileged the other day (with certain engineering contemporaries, excluding those concerned in the gas industry) to have an interview with the Electricity Commissioners for enlightening purposes. But there was not much that was new which could be given; Sir John Snell and his colleagues being obviously tied until further disclosures are made by the introduction of the Bill in Parliament. But we are confident that, as a result of the interview, doubts must have been hardened as to whether all the good things intended by the scheme would come to pass. There is to be the heavy capital expenditure; but generation economies are expected to be able to bear a big load of costs attached to distribution and the work necessitated by standardization, and yet yield a balance to go towards a reduction of charges to the community. The electricity industry is also to come under a somewhat complicated control mechanism, with certain compulsory powers in the background, the existence of which, it is hoped, will be sufficiently potent without their exercise to make any would-be refractory generating authorities yield up their powers and come into the fold without occasioning trouble. Central electrical officialdom will become bigger, more powerful, and more costly. It is evident that in this matter—in the Committee inquiries which have been made, in the advice to the Government, and in all that has issued therefrom—the gentlemen who have pulled the strings have been the Electricity Commissioners. The "Electrical Times" says: "The Commissioners are much to be congratulated on the confidence evidently reposed in them by the Government, for it is not difficult to trace their hand in the Weir report, and in the subsequent speech made by Mr. Baldwin, at Birmingham."

Naturally, the Commissioners are convinced that they are going on the right lines by the expenditure of several millions of pounds to save "many millions" a year to the country in its expenditure on electricity. What is meant by "many millions" has not yet been defined—in fact, Sir John Snell says he is not prepared at the moment to say what the estimate is, but it will come out in due course. The first object is to get electricity generated at the cheapest possible rate by taking advantage of all modern improvements, and bringing about a concentrated improved load factor. The standardized frequency is a necessary preliminary to complete flexible interconnection of all the systems, and the breaking-down of the barriers which hedge and restrict them at the present time. By this means it is hoped to reduce the heavy burden of reserve plant at present carried by the industry. The reserve plant in existence last year, Sir John states, was no less than 68 p.ct. of the actual maximum load; and it is hoped to bring it down to about 10 p.ct. There is to be no interference with existing distributors. Electricity in bulk is to be their raw material. Apart from new stations, selected ones are to be retained by their present owners, and are to be worked by them under the general direction of the Central Board, and in the most advantageous way. In other words, the engineers are to be taught their business, and work to the conditions prescribed for them. Through the Board, the Joint Authorities, and the power companies, it is believed by the Commissioners a cheap bulk supply can be brought about. Supplementing the production of the super-stations, the Board will be prepared to receive supplies of energy from any source of waste heat.

The Prime Minister, in his speech, stated that what was proposed was in no sense a Government Department; but we are afraid the electricity supply industry will have a little difficulty in satisfying itself as to where precisely Government control ends, and where that which is not Government control begins. It is easy to see where the division is supposed to exist, but does not do so actually. Piecing together information given at the interview with the Technical Press, it is found that the central organization will have a Minister at the head. Next come the Electricity Commissioners as the judicial body. Succeeding is the Central Board as an executive body, with powers over the whole country, and controlling all genera-

tion and main transmission. Their scheme will have to be submitted to the Electrical Commissioners for approval. The Joint Electricity Authorities will also continue in existence, and will not be interfered with in their duties and the administration of their districts; and they will deal with the provision of secondary transmission lines in their areas. This seems a complicated piece of control machinery to place upon a public utility industry; and the sum of its upkeep and working expenses will not be a negligible quantity.

Regarding finance, it will be remembered that the Prime Minister stated that the Central Executive Board are to raise their own capital and work on ordinary commercial lines. The figure he gave as the estimated capital expenditure was 35 millions; he spoke of its being raised over seven years, which would average 5 millions a year. The "Electrical Times" has obviously a feeling that the 35 millions is a spare computation; it says it is clear that, "if something like 50 or 60 millions sterling is to be spent on co-ordinating, standardizing, and inter-connecting the various systems, the electrical supply industry must pay for it." Such a sum will require a good deal of profit for satisfying its charges in the way of interest and sinking fund; and Sir John said positively: "There is "to be no Government subsidy of any kind or descrip-"tion." This is a heavy blow to those who had been nursing the hope that as the Government were calling the tune, they would pay the piper. The millions which will have to be borrowed—whether 35, 50, or 60—will be guaranteed by the Government, in order that it may be raised at reasonable rates; but sinking fund and interest are to be suspended for five years, during which period the interest will be capitalized, which will add to the subsequent requirements for liquidation. The interest and sinking fund will eventually fall upon the units generated in the respective districts. It is, however, the view of Sir John that the savings to be effected by the scheme will more than cover the charge per unit entailed by the capital expenditure. There are not a few men in the electricity supply industry who are wondering deeply. There are others who do not feel competent to say much about the probable results of launching into this enormous scheme. The manufacturers of electrical plant are rubbing their hands with glee. People who watch for opportunities for making a bit of money by speculation in the Stock Market are buyers of the shares of such firms; and the Stock Exchange is thus reaping some benefit from the fillip to business given by the Government. Already profit-taking has been recorded in the City columns of the Daily Press.

Coke-Fired Super-Stations.

In view of current events in the coal and electricity supply industries, the publication of the high thermal efficiencies obtained with coke as fuel at the super-power station of the Manchester Corporation is not without significance, as will be seen by the article on the "Super 'Sandwich' System" in later columns. Following upon experience with this patented system at their Stuart Street station, where it was installed as a means of economy towards the end of the war, it has been embodied in the design of the new super-station at Barton. That this preference for the "Sandwich" system, in spite of the much-advertised advantages claimed for the pulverized coal system, has fully been justified by subsequent experience in actual practice is now clearly demonstrated by the publication of results achieved in this and other countries, and in similar circumstances as regards the unit capacity and output of the steam-boilers used and the efficiencies realized. Using 46·6 p.ct. of relatively cheap coal slack, "sandwiched" with 53·4 p.ct. of presumably still cheaper coke breeze, an overall thermal efficiency of 84·2 p.ct. was obtained; whereas the highest efficiency claimed for the pulverized coal system of firing, as demonstrated at the new French (Comines) super-station, is 80 to 84 p.ct.

It has been pointed out more than once recently that the relatively low overall efficiency of thermal-electric generation with coal as fuel can be justified only by the use of low-grade fuels regarded as useless or unsuitable for use in bye-product recovery processes. The present tendency is to break away from this fundamental condition by using relatively high-grade coal in pulverulent form. Advocates of the pulverized coal system do not seriously pretend to provide for the economic recovery of bye-products; and having regard to the high cost of drying, crushing, and grinding, it is idle to claim that really low-grade classes of coal can economically be utilized by means of this system. The additional proof that a simple and ready means exists of utilizing untreated low-grade coal to the greatest advantage, while at the same time providing an economic outlet for surplus coke breeze (as has been demonstrated at Barton) is therefore at the present juncture an event of the highest importance, viewed from the national economic standpoint. But it is doubly gratifying that this invention, and the sustained effort necessary to secure its permanent adoption by rival interests, should have emanated from within the gas industry. In perusing the admirable series of articles describing the Barton power station in "Engineering," regret is felt that, so far, no mention of this fact, or of the inventor of the system (Mr. E. W. L. Nicol), has been made.

Hopes, Economy, and Subsidies.

The Chancellor of the Exchequer, the President of the Board of Trade, and Mr. F. C. Goodenough, Chairman of Barclay's Bank, have, within the last week or so, been unanimous in declaring that there is a brightening outlook for industry and trade. We are glad to have these opinions from those who stand on such pinnacles of observation; but the hopes which they raise are spoilt by the attitude of the extremists on the side of labour. Such men are now found everywhere in the ranks of labour; and through them it is difficult to find in the labour world any unanimous earnest of a desire to work for better times. With the coal industry as it is, the miners' leaders will not supply a single opening through which there may be operation in the attempt to restore the industry to a better and happier condition; and if, as the result of the Coal Commission, anything is done or recommended which comes in conflict with their own policy or decrees, then all the hopes of a coming of greater prosperity are to be wrecked, and in the work of destruction of national interests (which include those of labour) the workers of other industries are to be invited to take part. We have also the action of the railwaymen in rejecting the advice of their leaders to accept the wages and conditions award of the National Wages Board, to which award the men's own representatives put their signatures. The award does not in any way alter the conditions under which the existing employees have been working. Although it does not give the companies the financial relief to which they considered they were entitled in view of the economic circumstances of the industry, they accepted the rulings of the Wages Board. After the rejection by representatives of the men, negotiations were opened with the railway managers, who again resolved to adhere to the award, which was the proper thing if collective bargaining is to continue to be honoured. Matters reached an acute stage on Monday, when a resolution to declare a strike on Friday was discussed. Fortunately this deplorable issue was averted. By the narrow majority of five, at a conference of representatives of every grade of the service, a decision was reached against declaring a strike and in favour of accepting the award. The President of the National Union of Railwaymen (Alderman W. Dobbie) and the Right Hon. J. H. Thomas, M.P., worked hard for peace.

While these things are going on, clouding the readings of the outlook by those in the position to make them, the Chancellor of the Exchequer, at a meeting of the Leeds Chamber of Commerce, revives interest in the subject of national economy. He tells us the Government are going to give effect to their views on the subject as a result of the survey that has been made, and that at an early date an Economy Bill is to be introduced into Parliament in order to carry out their decisions. There is no precise information as to what is to be done; but one commentator says: "At present the economies will not involve "drastic changes of policy. A considerable proportion of "the savings will be of a purely administrative character; "but where a statute places upon the Government a duty

"which it is no longer desired to carry out owing to the "stringency of the financial situation, steps will have to "be taken to pass legislation repealing or amending "provisions in the particular Act relating to the matter." It is not known whether this means the undoing of work of the present Government or of predecessors; but while the Government are filled with a desire to retrench, they cannot tear themselves away from the contemplation of fresh expenditure.

It was seen last week that, although the Premier hopes there will be no need for a subsidy in connection with the Government electricity scheme, he made no promise that there should not be one. Supposing the anticipations as to public subscription of the necessary money for carrying-out the work and the estimates of expenditure are falsified, will the Government step-in with public money for the assistance of the industry? Then hints are being made in the newspapers of an "impression" in Ministerial circles that "it will be difficult, if not impossible, to discontinue entirely the financial assistance given to the coal industry on the expiration of the subsidy at the end of April." It is pointed out that, if it is necessary to embark upon legislation, it may well be the end of June before a measure for the reorganization of the coal industry could be placed on the Statute Book. Hence the possibility of the Government considering two courses. Continuing the subsidy on a lower or gradually diminishing scale; or, in order to assist the industry during the process of reorganization, granting a loan on exceptionally favourable terms, or, alternatively, allowing the industry to take advantage of the Trade Facilities Act. This, of course, may be a policy which, in the circumstances, cannot be avoided. Mr. Churchill, however, did not, in his economy speech at Leeds, say anything regarding this extended financial assistance to the coal industry, nor (so far as we read) did he hint at any possibility of financial assistance being rendered to the electricity industry. New expenditure and good resolutions as to economy would not have gone well together. As a matter of fact, Mr. Churchill denied the prediction as to the coal subsidy costing the country 50 millions sterling, and said the available information suggested that 21 millions would cover it, of which 19 millions would come into the current financial year. But there seems to be paving-the-way work proceeding for an increased national expenditure on the coal industry after April. If it can be avoided, so much the better.

Coal and Coke Export Trade in 1925.

THE Board of Trade Returns for December contain statistics applying to the whole of the past year; and they reveal how greatly the British coal industry has been affected by the reduction of exports and of values. In this decline, gas coke, as well as metallurgical coke and patent fuel, has had part, but patent fuel to a less extent than either class of coke. The position in connection with coal and coke is, of course, due to the increasing improvement of the output of coal in countries abroad, and their gain in competing ability, which includes lower costs of production—at any rate, in respect of coal. Regarding coal, the quantity shipped in the twelve months amounted to 50,817,118 tons. In 1924, the exports were 61,651,273 tons; while in 1923 they amounted to 79,459,469 tons, which shows that, between 1923 and 1925, there was a shrinkage of no less than 28 million tons and upwards. The value returned for the coal sent abroad last year was £50,477,211, which averages 19s. 10·3d. per ton. But nearly £1 per ton does not apply to the whole year, inasmuch as the prices obtained in its early part were in excess of those with which the year finished—particularly after the application of the Government subsidy to the industry. Prices were then reduced with the view of saving a further slide in the export trade. Subsequent experiences prove that price to-day is an important consideration in obtaining business abroad. As a matter of fact, the average price realized in December was 18s. 5·5d. per ton, compared with the average for the year of 19s. 10·3d. The value of the coal exported in 1924 was £72,079,547, or an average of £1 3s. 3d. per ton; while the value of that sent overseas in 1923 was £99,847,237, or £1 5s. 1d. per ton. Of the foregoing quantities and values, gas coal last year amounted to 6,820,414 tons, of a value of £6,272,545, or an average of 18s. 4·7d. per ton. In 1924, the proportion of gas coal was 8,434,869 tons, of a value of £9,565,862. In 1923, the corresponding figures were 9,102,450 tons, and the value £11,058,880.

Coming to gas coke, there has been a persistent slide since 1923. The business done last year is represented by 889,281 tons, the value of which is returned as £963,351, which averages £1 1s. 7·9d. per ton. In 1924, the quantity shipped amounted to 964,539 tons, which had a value of £1,682,203, while in 1923 the quantity exported was 1,224,302 tons, of a value of £1,990,532. The difference in quantity between 1923 and last year amounts to no less than 335,021 tons. Comparing quantities with values, it will be seen how greatly we have suffered in the matter of revenue from the sales of coke abroad; the reasons, of course, being partly the same as those which have affected the export coal market, combined with the greater competing power, compared with preceding post-war years, of Continental producers of gas coke. Regarding metallurgical coke, the quantity exported last year was not half that shipped in 1923. Last year the amount was 1,222,476 tons (value £1,464,385); 1924, 1,847,672 tons (value £2,999,822); 1923, 2,745,905 tons (value £6,383,140). Patent fuel has all through been in better case. The quantity sold abroad last year was 1,160,903 tons, of a value of £1,408,890; in 1924, 1,067,207 tons, of a value of £1,549,083; and in 1923, 1,066,843 tons, of a value of £1,725,679.

Leeds University Appeal.

At the end of last week it was announced that the Leeds University Appeal Fund for half-a-million pounds has so far resulted in over £250,000 being raised.

Our Foreign Trade.

At the beginning of last year, there were (as now) optimistic expectations of a considerable improvement in trade; but these have not matured. In 1924, there was a big difference between imports and exports, and the relation of the one to the other has not mended. On the contrary, the past year has produced not only a formidable increase in the adverse balance, but an actual decline in exports. Our imports for the year amounted to £1,322,858,167—an increase of £45,419,023. The value of the exports was £773,086,410—a decrease on 1924 of £27,880,427. Re-exports amounted to £154,410,967—an increase of £14,440,824. However, there is some consolation in the knowledge that more than half the year's increase in imports is attributable to purchases of raw materials, which suggests that our manufacturers are not regarding the future with profound pessimism.

Unemployment Grants.

The Executive Committee of the London Labour Party do not approve of the circular-letter issued to local authorities by the Unemployment Grants Committee, which intimates the desire of the Government to limit the grants to schemes specially devised for the relief of unemployment, and not allow them for schemes which would in the normal course of things have to be carried out. The London Labour Party desire that the circular-letter (which was referred to in the "JOURNAL" for Jan. 13) should be withdrawn. Among other points in the document was the statement that the Government had decided that, in the ordinary way, work which has not been accelerated to the extent of five years shall not be eligible for Government grants. This condition, it is felt by the petitioners for withdrawing the letter, will make it far more difficult for local authorities to put in hand relief work. They also prefer that work for wages should be encouraged rather than an increased number of workless and of those dependent upon the guardians. It is thought far better that the burden should be borne by national taxation rather than by local rates, seeing that the system of national taxation is more comprehensive than local rating.

Coal Exports.

During December, the coal exported did not reach the quantities sent abroad in the same month of 1924 or 1925. Last month the total amount shipped was 4,632,051 tons, of a value of £4,275,360. In December, 1924, the quantity was 5,167,525 tons, of a value of £5,571,766; and in 1923, 5,873,965 tons, of a value of £7,176,445. In these figures gas coal last month was represented by 594,867 tons, with a value attached of £481,521, which averages 16s. 2d. per ton. In December, 1924, the gas coal exported amounted to 673,498 tons, of a value of £713,969; and in 1923, 622,707 tons, of a value of £761,781. The quantities and values of the gas coal shipped during the complete year are referred to in our editorial notes this week.

Gas Coke Shipments.

In December, the gas coke business abroad exceeded that for the same month of both 1924 and 1923. The amount shipped was 169,864 tons, of a value of £173,205, which averages £1 os. 4·7d. per ton. In December, 1924, 81,187 tons were shipped; the value being £137,245. In December, 1923, the quantity was 109,417 tons, of a value of £189,028. It will, however, be seen from the reference in our editorial columns to the year's export business that gas coke showed a great decline in respect of both quantity and value.

Tar Products.

December saw very little business with customers overseas for benzole. Only 546 gallons were exported, as compared with 6118 gallons in December, 1924. During the whole year the total amount shipped was 146,891 gallons, which compares with 1,213,779 gallons in 1924. This shows that the production of benzole here has been for the most part retained for home consumption. Naphtha last month only figures for 6757 gallons, as compared with 5310 gallons in December, 1924. The total quantity shipped during the year was 61,219 gallons, as compared with 170,417 gallons in 1924. Regarding tar oil, creosote, &c., the shipment last month only reached 366,643 gallons, as compared with 4,921,956 gallons in December, 1924. This is a tremendous drop; and it is reflected in the total for the year, which amounted to 37,130,931 gallons, as compared with 45,322,284 gallons in 1924.

Sulphate of Ammonia.

Last month the shipments of sulphate of ammonia totalled 23,653 tons, as compared with 24,594 tons in December, 1924. The total quantity exported during the year was 262,262 tons, as compared with 277,749 tons in 1924. It will thus be seen that there has been a drop of 15,487 tons. The best customers for the year were Spain and the Canaries, with 113,144 tons. Japan comes next with 42,822 tons, and the Dutch East Indies follows with 27,441 tons. France has diminished its purchases to a very considerable extent. It only took 7077 tons last year, as compared with 30,855 tons in 1924. On the other hand, Italy has increased from 3463 tons in 1924 to 10,480 tons in 1925. British West Indies stands practically the same, with 10,311 tons last year, compared with 10,582 tons in 1924. "Other countries" together absorbed 50,987 tons, as against 49,366 tons in 1924.

Gas Oil and Petroleum Products.

Last year a new record was registered in the imports of petroleum products. The total was 1,606,874,528 gallons, as compared with 1,570,910,891 gallons in 1924. But although there was this increase, the total value was lower—£39,512,560, as compared with £41,424,417. Of these figures the imports of gas oil last year accounted for 72,635,202 gallons, of a value of £1,275,603, which works out to 4·21d. per gallon. In 1924, 67,905,598 gallons of gas oil were received, of a value of £1,209,746, or 4·27d. per gallon. The other items constituting the 1,606,874,528 gallons were as follows: Illuminating oil, 141,649,425 gallons; motor spirit, 404,874,801 gallons; lubricating oil, 85,473,332 gallons; fuel oil, 334,401,599 gallons; crude oil, 561,621,482 gallons; and other products, 6,218,687 gallons. The item of crude oil was an increase of 97,258,212 gallons on the preceding year; this being due to the expansion of the home-refining industry.

PERSONAL.

F. W. GOODENOUGH, C.B.E.

Well-deserved for indefatigable service in connection with the Gas Section of the British Empire Exhibition, the honour of "C.B.E." has been conferred by the King upon Mr. F. W. Goodenough. In order to make the industry's exhibit a great success, he was unsparing and inspiring in his personal sacrifice of time and energy. The whole of the gas industry will rejoice with us over the recognition that has been made of this. At the same time, we know that Mr. Goodenough's view is that the honour is to the industry—not to the man, though he is proud to be the agent for its receipt. A very large amount of the credit for the Gas Exhibit, he holds, is due to the initiative and capacity of those who planned and carried it out, the splendid staff who made it live and work, and the wonderful backing the Committee and the Executive Chairman received from the industry throughout the Empire.

Mr. T. A. CANNING, F.C.S., of the Newport (Mon.) Gas Company, has been appointed to the position of Technical Assistant to the Dewsbury Corporation Gas Department.

Mr. D. T. LIVESEY, of Manchester, has been appointed to the position of Works Superintendent at the Saviletown Works of the Dewsbury Corporation Gas Department.

We learn that our esteemed friend Mr. F. D. MARSHALL is on a visit to the United States, to select a site for a low-temperature carbonizing plant, and incidentally to attend, at the end of this month, the Engineering Congress at Chicago, where the question of low-temperature carbonization will be to the fore for discussion.

ELECTRICITY SUPPLY MEMORANDA.

THERE is a great division of opinion in the electricity supply industry as to whether the Government scheme is going to be the remarkable benefit to the country that its creators imagine; and the Birmingham speech of the Prime Minister, in which he indicated the framework of the scheme, has done nothing whatever to turn the balance of opinion from the unfavourable to the favourable side. Comment on the speech was made in our editorial columns last week; and so far we see no reason to change any of the views then expressed. In its main features, apart from the financial aspects, the Government scheme is little more than the policy of the Electricity Commissioners enlarged, with compulsory powers attached for the new electrical authority. But although the Commissioners have had no compulsory powers, they have been able to take a compulsory attitude by refusing sanctions to extension of the generating plants of existing undertakings, or the erection of new stations; so compelling the taking of bulk supply from larger stations. The Commissioners in their recently issued annual report said: "It has been the constant endeavour since 1920 to bring about the suppression of small-scale generation in a multiplicity of stations." In certain cases, it has been seen that the result of this is a payment for electricity in bulk in excess of the local generating costs; and in one instance quoted in the "Memoranda" last week, it was noted that breakdowns in supply have been frequent and extremely unpleasant and uneconomical in respect of the consequences. Interconnection of stations may reduce the serious results of this inherent weakness of electricity supply. But one hope of the designers of the Government scheme is that interconnection will eliminate much of the plant required for stand-by purposes, and the capital expenditure and maintenance involved by it. If this is so, then it will deprive a station of much of the power to be of effective service in the case of an emergency at another station. We think economy in this direction will disappear in the face of the responsibility attaching to the maintenance of a full supply, wherever or whenever disaster overtakes a station. There is also a strong division of opinion among electrical engineers as to the value of the large expenditure on the standardization of frequency. There is a greater and a growing disbelief among them as to the country benefiting from lower costs of generation, in view of what is already being accomplished by the few stations producing more than half the electricity in the country, and the fact that the costs of transformation and transmission to the areas of the other stations will, in numerous cases, about absorb the difference between the cost of generation at the super-station and the cost of generating locally. Throughout the country the costs of generation have been diminishing, without the Government scheme. There is no question in the minds of many electricity supply men that the scheme is one which will benefit to the greatest extent the electrical plant makers, and not the country as a whole. To carry it out, 35 millions of capital will be involved. Is that the end of the capital cost of the change-over? Whether or not it is, the cost of the upkeep of the transmission system will not be light.

Division of Opinion.

Safety!

Sheffield does not like collapses of the electric current. There was a double cessation of the service on Monday of last week. About 3.30 p.m., offices and shops in the High Street were in darkness for ten minutes; and about five o'clock consumers were again without light for something like half an hour. The reports in the local papers tell readers what they knew—that the breakdowns caused much uneasiness among the shopkeepers. The primitive candle came to the aid of the presumptuous successor. Jewellers especially were afraid that an attempt might be made by some people to enrich themselves from their stocks; but one jewellery firm did not find it necessary to close their doors (as did others), inasmuch as they had prudently retained gas when the electric light was installed. On the previous Wednesday, a section of Watson Walk and High Court in the same city was treated to a failure for 1 hour and 20 minutes. On Monday of last week, damage estimated at £1500 was caused by fire to Cliff House, Twycross, which was occupied by Lord Kenyon. A Leicester report says the fire is "supposed to have been due to the fusing of an electric wire." Several explosions in pavement electric boxes and culverts have recently been reported in the Press—one being in Piccadilly the other day. Travellers on the Hampstead Tube had good demonstration on Tuesday of last week that defects in electric systems can be responsible for fires. Short circuiting of some cables caused a stoppage of the traffic for an hour and a half; and dense, suffocating smoke issued from the tunnel into the booking-hall of Hampstead Station, which is 230 ft. above the level of the tube.

Cooking in Schools.

The London County Council Education Committee (No. 2) appear to be very dubious as to whether the teaching of cooking by electricity would be of any value in the schools which come under the jurisdiction of the Council. It was as far back as July 31, 1923, that the Council referred to the Committee the matter of considering and reporting whether or not cooking by electricity should be taught at appropriate centres. That is two-and-a-half years ago. Then in May last, the Committee reported that electrical cooking installations had been arranged experimentally at four cookery centres, and that a further report on the subject would be submitted when sufficient experience had been gained. It now appears from the agenda of the Council that the Committee have had before them an interim report on the arrangements at the four centres; and they consider it advisable that still further experience should be acquired of the working of the experimental scheme before any decision is come to on the general question of the introduction of electric cookery into suitable centres. A continuance of the experiment has been authorized for another year, at the end of which it is proposed to go fully into the various issues involved, and to report further on the matter. Underlying this report, there appear to have been difficulties; and certain it is that the Committee, on the strength of the experience already obtained, are not of a mind to present any definite decision and recommendation.

A Woolwich Experiment.

An oft-quoted experiment in connection with "all-electric" houses is that of four dwellings erected on the Eltham Estate by the Woolwich Borough Council. These houses have been occupied for upwards of a year; and therefore the "Electrical Times" thought it was opportune to give some information as to consumption experiences. One can well imagine that the tenants of these houses would, in the initial stages of the experiment—being duly impressed with the importance of economy where the use of electricity for heating purposes is concerned—do their utmost to economize to the fullest possible extent. But good resolutions in this regard, as in others, do not as a rule last long. Tabulated statements in the article by our contemporary show that with the advance of time there was gradual ascent in the consumption, quite apart from seasonal variations. The houses in question are semi-detached, and contain rooms which are described as "fair sized" ones, with bath, &c. We can imagine from this description that the rooms are not very large; and therefore that the heating requirements would not be of an extensive order. In each house there are nine lighting points, heating-plugs in all bedrooms, living-room, and parlour, one 3-KW. fire (fitted with hot receptacle for plates, &c.), one 600-watt bowl fire, one full range electric cooker, one wash-boiler, and electric water-heating apparatus. The total connected load is about 13½ KW. per house. It will be seen from this that the provision for heating is on a remarkably modest scale; and the fact that the bowl fire would have to be moved from room to room, and the occupants of the house take turns at utilizing such comfort as it can afford, goes to indicate the presence of the old ruse of the electricians to promote economy of the use of electrical energy by scarce provision for its use. There are four tables in the article supplying figures as to consumptions. No. 1 has in family three adults, and two school children at home during holidays. In No. 2 house there are two adults and one child; in No. 3, three adults and four children; and in No. 4, two adults and one child. These cannot be called large families, excepting perhaps in the case of No. 3. We do not know whether the tenants of these houses happen to be employees of the Electricity Department; but if so, naturally they would be able to keep their apparatus tuned-up to first-class condition, which is not the case with ordinary householders. The tables show the actual meter readings, the units consumed, and the revenue received per house, from November, 1924, to the third week in December last year. The revenue is calculated at 1d. per unit, which is a low price, and cannot possibly include anything for installation, upkeep, renewals, or any other charge than the bare one for generating the current.

Results.

In the first table dealing with the house occupied by three adults (with two school children home during holidays), it is noticed that the total energy consumption between Nov. 12, 1924, and Dec. 21, 1925, was 7327 units, which at 1d. per unit cost £30 8s. 10d. Taking the period from Dec. 1, 1924, to Dec. 1 last year, the consumption was 6500 units, which cost £27 1s. 8d., equivalent to 1s. 5¾d. per day. That is an interesting feature of the table, as also of the other three tables, seeing that the average of 1s. 5¾d. per day is only obtained by the artifice of amalgamating the low consumption during the non-heating and also largely non-lighting months of the year with the higher consumption of the months when light and heat are pressingly required in the house. In the circumstances the average per day for the whole year is an unfair method of presenting such data. Take, for example, the meter reading on Dec. 21 last, it showed that between Oct. 23 and that date 1550 units were consumed. That includes a period for heating, and be it remembered heating which was limited owing to the Lilliputian means afforded for enabling this important item in domestic comfort to be enjoyed. Between those dates, there were fifty-eight days, and the 1550 units at 1d. cost £6 9s. 2d. During those fifty-eight days, therefore, the cost per day was not 1s. 5¾d. (or 11s. 2¼d. per week), but 2s. 2·7d. per day, or 15s. 6·9d. per week! We should have been better pleased if the meter reading had included the whole of December, in view of that being an example of a good winter's month. We have spoken earlier of the economy which was shown by the residents at the beginning of their electrical career. We see that the meter reading for Jan. 3, 1925, showed a consumption from the previous meter reading of 727 units, and, the period being thirty-five days, this averaged 20·7 units per day; whereas, in the longer period of 58 days up to Dec. 21 last, the consumption averaged 26·7 units per day. Of course, it may be said that this is no evidence of an advance in uneconomy, in view of the fact that some of the days may have been colder in the 58-day period than during the 35-day period at the end of 1924. In the second house, the units consumed between Nov. 12, 1924, and Dec. 21 last amounted to 7495, costing £31 4s. 3d., or, in the period from Dec. 1, 1924, to Dec. 1 last, 6650 units, which cost £27 14s. 2d.—equivalent to 1s. 6¼d. per day. The same criticism applies to this "per day" figure that we made in No. 1 case. This house is tenanted by two adults and one child, so that the consumption worked-out to rather more than the larger tenanted dwelling previously referred to. In the third case—a house inhabited by three adults and four children (poor kiddies!)—the consumption of energy between Nov. 10, 1924, and Dec. 21 last amounted to 5509 units, which cost £22 19s. 5d. The energy consumed between Dec. 1, 1924, and Dec. 1 last was 4650 units, which cost £19 7s. 6d., equivalent to 1s. 0¾d. per day. In the fourth case, with two adults and one child, the energy consumed between Nov. 10, 1924, and Dec. 21 last, amounted to 6493 units, which cost £27 1s. 3d. Taking the period from Dec. 1, 1924, to Dec. 1, 1925, 5700 units were consumed, which cost £23 15s., equivalent to 1s. 3½d. per day. It will be seen from the figures that with electricity the requirements of different families vary just as they do with gas. Considering the total expenditure of these people, with the striking economy in the heating arrangements provided for them, the expenditure has an appalling appearance against the 12,000 to 20,000 c.ft. consumption of many prepayment gas-meter consumers who use gas for both lighting and cooking. We do not think that the presentation of such figures as £27 1s. 8d. (or in a winter week 15s. 7d.), £27 14s. 2d., £19 7s. 6d., and £23 15s. per annum would influence many prepayment gas consumers to change their present system to that of electricity, even with the charge of 1d. per unit dangled before them as a bait. Moreover, who will equip, maintain, and renew the appliances at 1d. per unit of current consumed? The tenants of the houses must have to pay. All their costs are not shown in the energy consumed.

Commercial Gas Company.—At the annual general meeting to be held on Feb. 18 the Directors will recommend the payment of dividends for the half-year to December last at the rates of £5 6s. 8d. p.ct. per annum on the 4 p.ct. stock and £5 3s. 4d. p.ct. on the 3½ p.ct. stock, both less income-tax. The dividends for the first half of the year were at the same rates.

THE GAS INDUSTRY AND THE ELECTRICITY SCHEME.

Interview with the Minister of Transport.

At the request of the Minister of Transport, Lt.-Col. the Rt. Hon. Wilfred Ashley, M.P., representatives of the gas industry attended at the offices of the Ministry, 7, Whitehall Gardens, on Friday, the 22nd inst., for the purpose of discussing the Government's proposals with regard to electricity.

The following representatives were present:

NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

Mr. D. MILNE WATSON, D.L., President, National Gas Council, Governor, Gas Light and Coke Company.

Mr. C. VALON BENNETT, Engineer, General Manager, and Secretary, Rochester, Chatham, and Gillingham Gas Company.

Mr. C. F. BOTLEY, M.Inst.C.E., Engineer and General Manager, Hastings and St. Leonards Gas Company (President, Institution of Gas Engineers).

Mr. WILLIAM CASH, F.C.A., Chairman, Bournemouth Gas and Water Company.

Mr. NORMAN S. COX, Secretary, Sunderland Gas Company.

Sir ARTHUR DUCKHAM, K.C.B.

Mr. J. H. ELLIS, Chairman, Plymouth and Stonehouse Gas Light and Coke Company.

Mr. T. GLOVER, C.B.E., M.Inst.C.E. (Lord Mayor of Norwich), Engineer and Manager, British Gas Light Company (Norwich).

Mr. T. HARDIE, M.Inst.C.E., Chief Engineer, Gas Light and Coke Company.

Mr. F. H. JONES, M.Inst.C.E., Chairman, Wandsworth, Wimbledon, &c., Gas Company, Consulting Engineer, Eastbourne Gas Company.

Alderman Sir WILLIAM KAY, J.P., Chairman, Manchester Corporation Gas Department.

Mr. H. D. MADDEN, M.Inst.C.E., Engineer and Manager, Cardiff Gas Light Company.

Mr. J. W. NAPIER, Engineer and Manager, Alloa Corporation Gas Department.

Mr. A. W. SMITH, General Manager and Secretary, Birmingham Corporation Gas Department.

Mr. SAMUEL TAGG, M.Inst.C.E., J.P., Engineer and Manager, Preston Gas Company.

Mr. CHARLES WOOD, O.B.E., F.C.S., Engineer, Bradford Corporation Gas Department.

Mr. HENRY WOODALL, M.Inst.C.E., Chairman, British Gas Light Company.

Col. H. W. WOODALL, M.Inst.C.E., Chairman, Swanage Gas Company.

Mr. S. S. OGILVIE, Joint Manager, the National Gas Council.

Mr. W. J. SMITH, Secretary, the National Gas Council.

GAS COMPANIES' PROTECTION ASSOCIATION.

Dr. CHARLES CARPENTER, Chairman, Gas Companies' Protection Association, President, South Metropolitan Gas Company.

Mr. R. B. ANDERSON, A.M.Inst.C.E., Engineer, Hessle Gas Company, Ludlow Union Gas Company, Ltd., and Westward Ho! Gas Company.

Mr. J. FERGUSON BELL, M.Inst.C.E., Engineer and General Manager, Derby Gas Light and Coke Company.

Mr. C. M. D. BELTON, A.M.Inst.C.E., A.M.I.Mech.E., F.C.I.S., Engineer, Manager, and Secretary, Shrewsbury Gas Light Company.

Mr. F. J. BRADFIELD, F.C.I.S., Manager and Secretary, Commercial Gas Company.

Mr. G. STEVENSON, Engineer and Secretary, Long Eaton Gas Company.

Mr. H. A. STIBBS, F.C.I.S., Secretary, Portsea Island Gas Light Company.

Mr. W. W. TOWNSEND, Engineer and General Manager, Colchester Gas Company.

Mr. F. COOPER, Secretary, Gas Companies' Protection Association.

A representative from the PRODUCER GAS INDUSTRY was also present.

An emergency meeting of the Central Executive Board of the National Gas Council has been summoned for Wednesday afternoon, the 27th inst., further to consider the question.

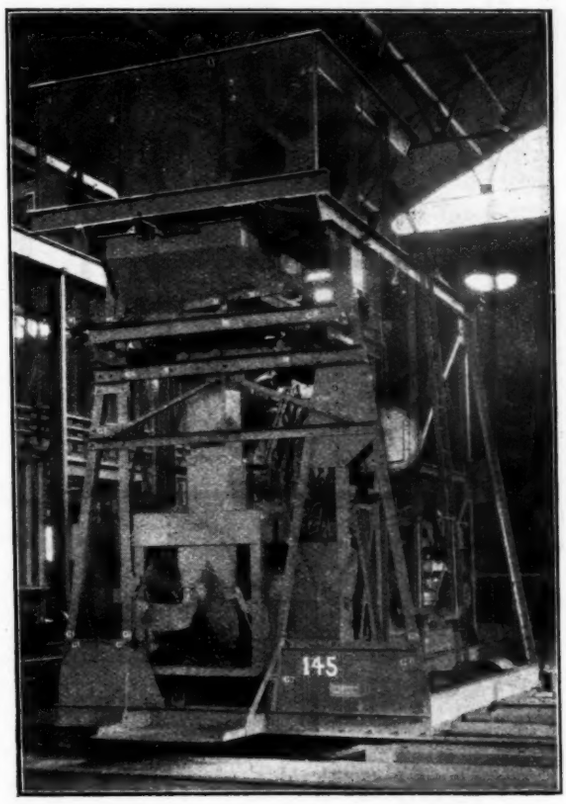
Gas Light and Coke Company's Dividend.—The accounts of the Company for the past year show that the balance to the credit of the net revenue account will enable the Directors to recommend the payment of dividends for the half-year to Dec. 31 last as follows: On the 4 p.ct. consolidated preference stock, at the rate of 4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of 3½ p.ct. per annum; and on the ordinary stock, at the rate of £4 17s. 4d. p.ct. per annum—carrying forward to the next account the sum of £107,988 8s. 11d.

FIDDES ALDRIDGE STOKING MACHINE WITH AUTOMATIC WEIGHING DEVICE.

Built for the Shanghai Gas Company.

It was in September, 1903, that we first illustrated the "F.A." machine, which had been designed and built to test the new method of charging retorts; and we now reproduce a photograph of the latest model produced by Messrs. Aldridge & Ranken, Ltd., Avonbank Works, Bath, to the order of the Shanghai Gas Company. This is the 145th machine, and is fitted with a weighing device—the latter being a "Denison." The weight of each charge can be recorded, and the record tallied with the amount dumped into the "go-downs."

The hopper, containing 5 tons, is fed from either of two local hoppers in the retort house. The feed from the hopper can be cut off instantaneously by specially designed double-acting doors when the desired weight has entered the weighing chamber. The latter is balanced upon liberally-designed knife edges; and the dial (which is 2 ft. in diameter, and indicates by 7 lbs. up to 12 cwt.) is visible to the driver on whatever tier he may be operating.



The general design of the feeding shoot to the charging chain, combined with the weighing apparatus, enables any pre-determined charge at once to be put into any particular retort, without special effort or attention on the part of the driver—this feature being one of the conditions laid down.

The machine is fitted with high-speed travelling gear, to enable coal to be obtained from local hoppers in the minimum of time, for it will be required to operate some 180 retorts. It has, of course, been specially designed to deal with Chinese dust coal, which it handles without raising any dust or fumes.

The order was placed with Messrs. Aldridge & Ranken by Mr. F. W. Potter, the Chief Engineer of the Shanghai Gas Company, during a recent visit to this country.

Westminster Technical Institute.—On Thursday, Feb. 11, at 6.30, a demonstration will be given of the testing of gas cookers, fires, geysers, &c., and other typical experiments comprised in the courses of instruction provided for employees in the gas industry who are preparing for the examinations of the Institution of Gas Engineers and the City and Guilds of London Institute.

The Practical Year Book and Diary.—From Messrs. W. G. Beaumont & Son, of Priory Works, Bow, London, E. 3, we have received a copy of this useful diary, which, in addition to much general information, contains many illustrations of the painting work carried out for gas undertakings by the firm, who have also forwarded a calendar with an amusing drawing by Lawson Wood.

NOTES ON THE EXOTHERMIC REACTIONS OF BITUMINOUS COALS AT LOW TEMPERATURES.

By HARALD NIELSEN, M.I.Chem.E., F.C.S., A.M.I Mech.E., and STANLEY BAKER, D.Ph., M.A.

From time to time interesting information has been published regarding the behaviour and exothermic reactions of bituminous coals during distillation or carbonizing. The work, however, has generally been carried on at higher temperatures (Hollings and Cobb; and later Davis, Place, and Edeburn, of the U.S. Bureau of Mines). They dealt with coals at temperatures between 250° C. and up to 600° to 650° C. According to these investigators, most bituminous coals show positive evidence of exothermic reactions at temperatures from 320° to 350° C.—younger carbonaceous materials at still lower temperatures. The quantity of coal dealt with in their apparatus was about 1 gramme; hence the apparent difficulty of conducting examinations at temperatures below 250° C. for measuring in gramme-calories definite quantities of heat of such a small order.

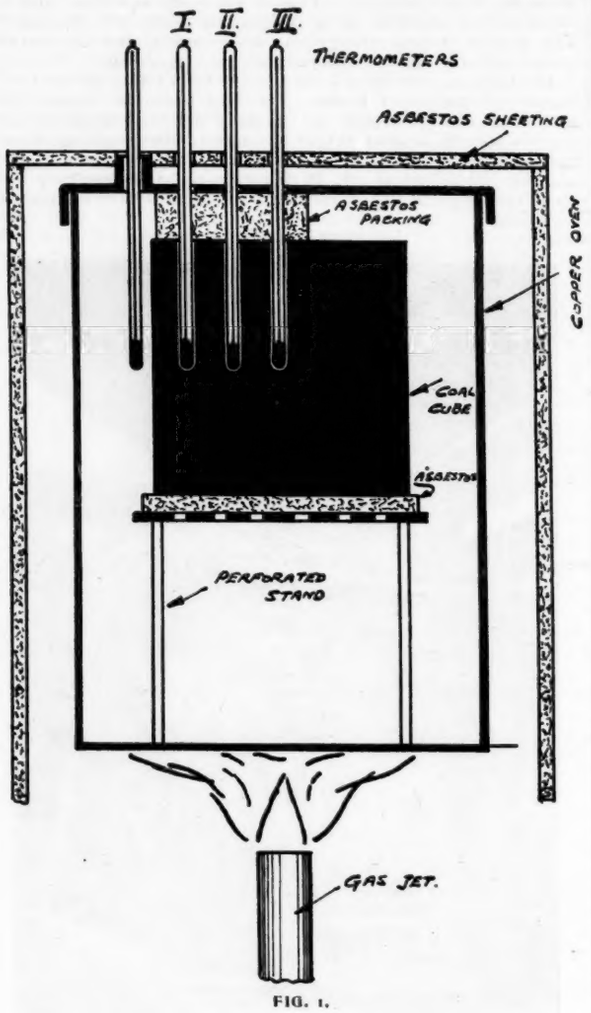


FIG. 1.

Recently, at Sheffield University, Prof. Wheeler has carried out work of a somewhat similar nature, by passing air over and through finely-powdered coal at various temperatures. He found that round 180° C. the thermometer immersed in the coal charge began to rise rapidly above the temperature at which the experiment took place. In other words, at about 180° C. a rapid and more pronounced oxidization of the finely-divided coal occurs.

There might be two causes for the occurrence. One is the atmospheric oxygen entering more vigorously into reaction with the coal (surface oxidation); the other, the oxygen in the coal substance itself attempting to effect an upgrading of the material, resulting in a reduction of the volatile matter and an increase in the fixed carbon content. The following experiments serve to indicate that the latter is probably the case.

During our work on distilling coal by a gaseous heating medium in rotary retorts (sensible heat distillation), it became desirable to know the temperature of the coal itself, apart from the temperature of the surrounding gaseous medium at any heating stage; the actual temperature drop from the outside to the centre of the coal particle itself in relation to the time of heating; whether any exothermic reactions took place at lower temperatures than those on which information has been made public; and several other things.

Without spending considerable time and money on expensive apparatus, it was decided to carry on tests of as simple a nature as possible, compatible with accuracy; and as the result exceeded our expectations, and may give the impetus to other more searching investigation, we have decided to publish the information obtained as far as we have gone at present, in order to prevent any initial overlapping.

First of all we decided to eliminate as far as possible one of the unknown factors—*i.e.*, atmospheric oxygen acting on a very large surface (powdered coal); to deal with a bulk of material large enough to give accurate readings without complicated measuring instruments; and to get as near as possible to actual working practice. Several coals were tested, but, as the characteristics are very similar in nearly all cases, we will give details of a typical coal only—a Derbyshire bituminous coal.

The procedure was as follows: A specially constructed copper oven was provided internally with a perforated stand, and an outside asbestos shield, thermometer openings, &c., as shown in fig. 1. A large cubical block of coal was carefully

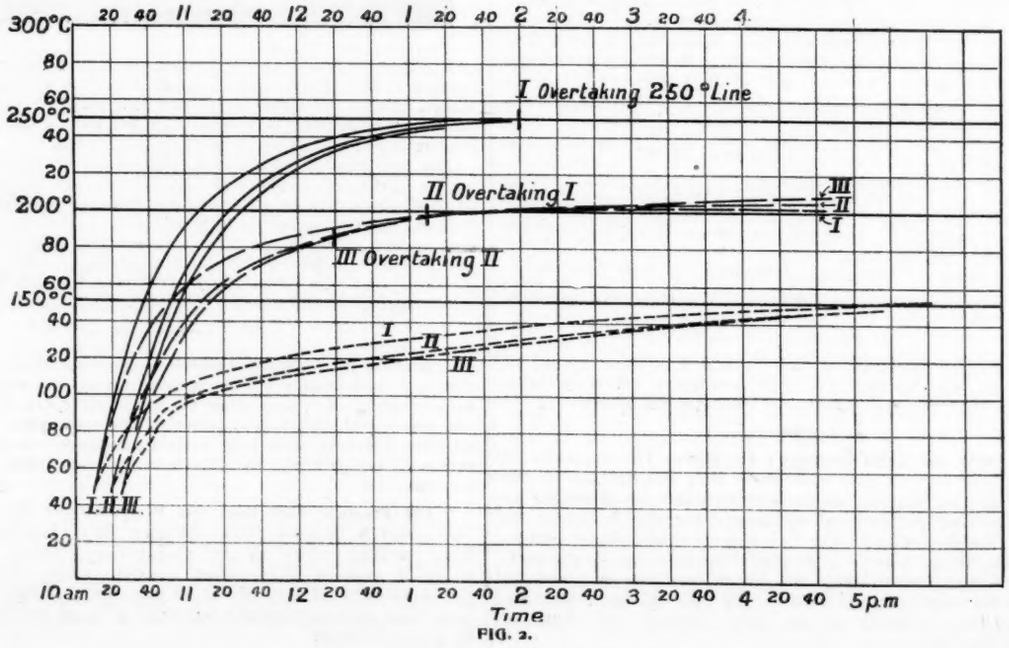


FIG. 2.

cut and ground, so that all sides were equal. Then a series of holes was drilled-down, parallel with one face, to the middle of the block. Any dust from the drilling was removed completely. The thermometers, carefully calibrated, were very closely fitted into the holes, and had a specially small mercury reservoir. The block was placed in position, and the thermometers insulated, as indicated in fig. 1.

The temperature was very quickly brought up to the desired limit, and maintained constant for eight hours. Three tests on each material were carried out at temperatures in the oven of 150° C., 200° C., and 250° C. The temperature-time curves for the various thermometers I., II., III. are plotted in fig. 2 for the Derbyshire coal. Cross curves giving particulars of the temperatures through the coal from the surface to the

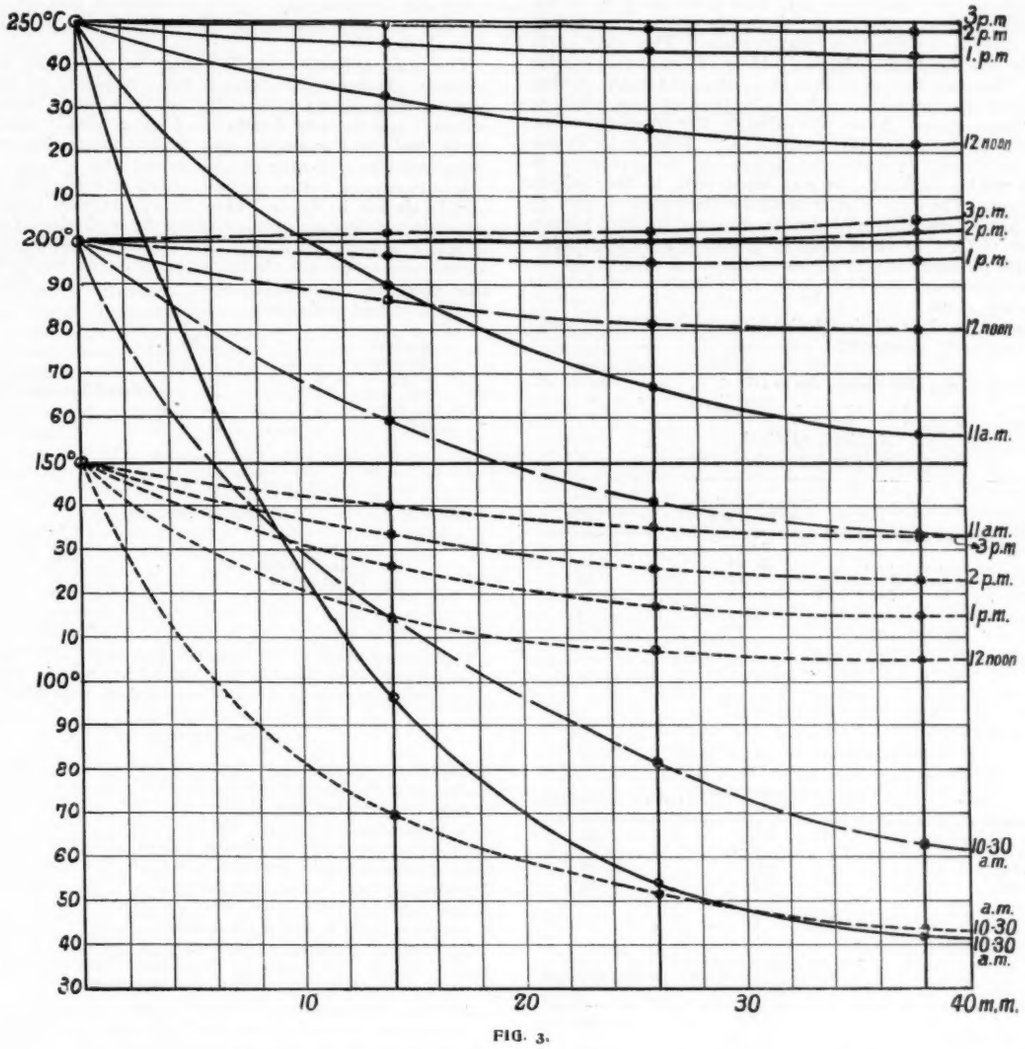


FIG. 3.

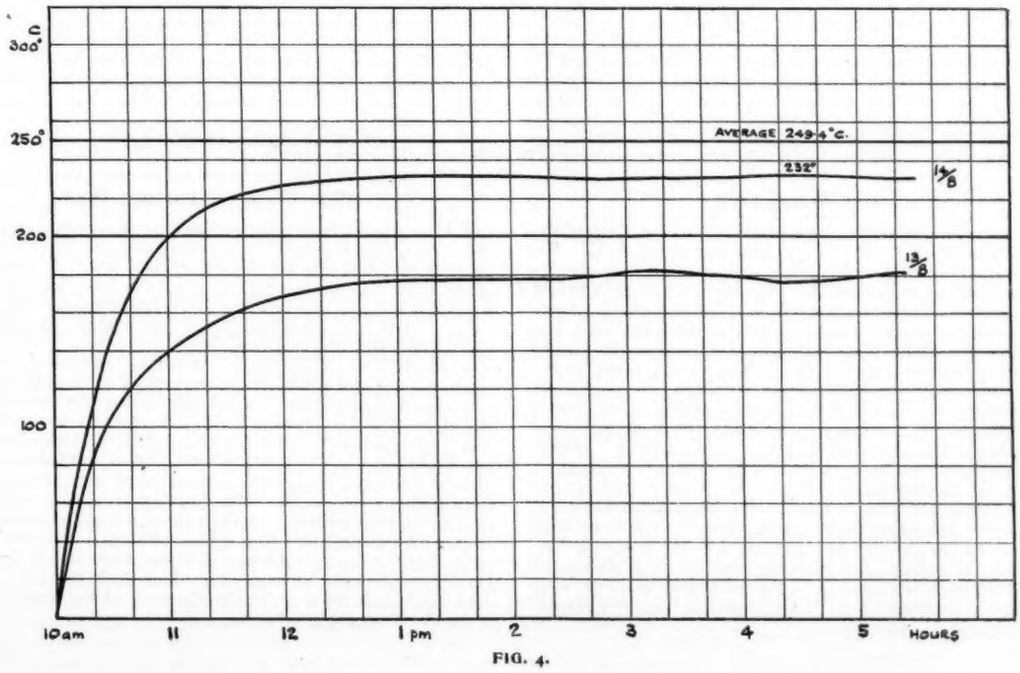


FIG. 4.

centre, temperature-distance curves, are shown in fig. 3. The curves are independently marked with the time at which the observation took place. It must be remembered that same extended over three days, so that each set of curves at one temperature limit represents one day's test.

Studying the curves for 150° C. (fig. 2) it will be seen that the inner thermometer commences, after seven hours, to overtake the next one—that is to say, that a counterflow of heat takes place; or, in other words, there are signs of exothermic reaction already at this low temperature. The 200° curves show this to a far higher degree. After 180 minutes' heating, No. III. thermometer overtakes No. II., and both of these No. I. after 200 minutes, and finally the 200 line after 220 minutes from start. After 300 minutes, the readings were: I. = 202°; II. = 203°; III. = 205·5° C. Thus it is evident that the exothermic reaction commences in the centre of the coal and works outwards in counter-current to the original flow of heat. The 250° curves overtake the 250 line after 240 minutes, but do not after a further 60 minutes' heating advance more than 1° C. In all probability it would have been advisable to use different blocks of the same kind of coal for the various temperatures at which the tests took place. This, however, was not done.

The original weight of the Derbyshire raw coal block before the test was 411·5 grammes.

	P.Ct.
Loss in weight after heating test at 150° C.	5·71
" " " " " 200° C.	0·48
" " " " " 250° C.	0·12

Analysis of Coal.

Classification: Meta lignitious (Seyler).

—	Ultimate Analysis on Dry Basis.	Ash Free.
	P.Ct.	P.Ct.
Carbon	81·40	82·40
Hydrogen	5·50	5·56
Oxygen	10·02	10·14
Nitrogen	1·10	1·12
Sulphur	0·77	0·78
Ash	1·21	..
	100·00	100·00

$\frac{C}{H}$ = 14·8

—	Proximate Analysis as Received.	Dry and Ash Free.
	P.Ct.	P.Ct.
Moisture	5·74	..
Fixed carbon	55·19	59·25
Volatile matter	37·97	40·75
Ash	1·10	..

—	Proximate Analysis after Final Heating Test (250° C.).	Dry and Ash Free.
	P.Ct.	P.Ct.
Moisture (hygroscopic)	1·80	..
Fixed carbon	59·16	61·10
Volatile matter	37·77	38·90
Ash	1·27	..

When attempting to localize the loss in weight of any of the proximate components, it will be found that, basing the calculations on the dry and ash free material, before and after treatment, the volatile matters have lost 1·82 p.ct., while the fixed carbon has gained 1·94 p.ct. The difference between the two figures is well within the limit of experimental error; or, in other words, the fixed carbon contents have gained in weight to the cost of the volatile matters, as part of the combined water begins to be evolved at these temperatures. No attempt was made to collect the water, free or combined, or to determine any possible CO_2. It was observed that the coal block commenced to crack along the bedding planes at 250° C. or thereabouts.

The main object in securing some indications as to the temperature gradients throughout the coal-piece, as well as the relative temperature differences between the outside gas temperature and the coal itself, had been attained; and we reluctantly had to discontinue this highly interesting work until there was less call upon the laboratory time.

A comparison curve obtained from a coking South Wales coal is shown in fig. 4. Here it will be seen that, although a certain equilibrium seems to have been obtained for a couple of hours, shortly afterwards the thermometer at around 180° commences to wobble—indicating that some changes begin to take place in the interior of the coal mass. The ultimate analysis of this coal was:

	P.Ct.	
Carbon	83·24	Classification: Para bituminous (Seyler).
Hydrogen	5·01	
Oxygen	7·70	
Sulphur	0·49	
Nitrogen	1·20	
Ash	2·36	
	100·00	

$\frac{C}{H}$ = 16·33 p.ct.

Proximate Analysis.

	P.Ct.
Moisture	1·67
Volatile matter	33·18
Fixed carbon	63·20
Ash	1·95
	100·00

This latter coal is of a somewhat older formation; and although reactions are clearly indicated at 180° C., they are not nearly so prominent as those of the former, somewhat younger, coal.

Conclusions.

The above observations seem to indicate the fallacies connected with the application of thermal conductivity coefficients in order to get any idea of heat flow through coal at temperatures higher than, perhaps, 100° to 120° C. These coefficients must vary very widely from coal to coal, and are entirely upset when any exothermic or endothermic reaction takes place.

Evidence of exothermic reactions due to the oxygen contents of the coal substance has been obtained for a number of bituminous coals at temperatures below 200° C.

An increase in fixed carbon, and a consequent decrease in volatile matter (upgrading), has been observed on various bituminous coals at temperatures at or about 250° C.—particularly on those of the younger genus.

Some indications of the nature of the heat flow from the outside to the centre of lump coal for the initial temperature differences at various time factors have been obtained.

The curves indicating the temperature drop through the coal mass emphasize the advisability, when distilling by internal heat, of dealing with small coal. The smaller the better, from the point of view of rapid heating and quick distillation—*i.e.*, large throughput of plant in a given time.

A New Refractory.

A new cement known as "Carboplastic" has been introduced by the Carborundum Company of Niagara Falls, N.Y. The principal ingredient of this cement is carborundum—one of the most highly refractory materials. By the proper selection of bonding materials, "Carboplastic" is made to inherit the refractory properties of carborundum, and at the same time lend itself readily to application with the "Carboplastic" gum, which is manufactured by the firm. The new cement is prepared for use simply by the addition of water, to give it the correct consistency. In air it sets with a strong bond, and is more resistant to high temperatures than the best grades of firebrick. At present the chief uses for "Carboplastic" cement are in minimizing the serious effects on firebrick settings of localized flame impingement, of cavities due to spalling and cracking, of destructive barring-off, of clinker formation, and of other causes for maintenance and repair. The firm state that by applying the cement as a coating over the firebrick face, or as a plastic refractory for patching, the life of firebrick settings is materially increased, and the need for frequent stoppage for repairs is eliminated. "Carboplastic" can be applied to either hot or cold settings.

Blue Glass for Furnace Work.

A blue glass which will absorb the ultra-violet rays has, says the "Gas Age-Record," been developed by the United States Bureau of Standards for protecting the eyes of foundrymen and other furnace workers. Safety engineers have insisted that men working around open-hearth or other high-temperature furnaces should use a brown glass which reduces the intensity of the light from the furnace, and also offers good protection against the ultra-violet rays. However, the furnace operators themselves prefer a blue glass, regardless of the fact that it only gives partial protection against the ultra-violet rays—maintaining that they can observe furnace conditions better through a blue than through a brown glass. This prejudice is probably due to their greater experience with a blue glass, because brown glasses are now being extensively used with satisfactory results in some industries. The blue glass recently made by the Bureau has, in addition to the colour and other desirable properties of the ordinary blue glass, the very desirable property of furnishing protection against the ultra-violet rays. The glass can be made by replacing about half the lime in a soft soda-lime glass with cerium oxide, and adding sufficient cobalt oxide to get the desired colour.

THE SUPER "SANDWICH" SYSTEM.

Low-Grade Coal and Coke Breeze.

Deductions to be drawn from the result of comparative tests made at super-power stations with raw coal, pulverized coal, and with 50 p.ct. of low-grade coal and of coke breeze fired on the patent "Sandwich" system, which have recently been published, tend to prove that the claims made for the system by its inventor are well founded.

Various test results from London and other power stations have been published, notably those of one London station which proved an increase in thermal efficiency and boiler output of 19 and 20 p.ct. respectively in favour of the "Sandwich" system. The results recently obtained with this system at the super-power station of the Manchester Corporation (published in "Engineering" for Jan. 15) are even more gratifying, since they relate to the largest capacity steam boilers in this country, and synchronize with the publication of results obtained in similar circumstances with coal alone and with pulverized coal.

The Barton (Manchester) super-station is already famous for its overall thermal efficiency, which exceeds that of any other power station in this country. Its boiler-house equipment includes nine boilers, each of 100,000 lbs. per hour normal evaporative capacity. According to the report of the Electricity Commissioners for the year ended March last, the coal consumption per unit generated is well below that of any other British station; the average then being 1·51 lbs. It is now stated, however, that these excellent results have been improved materially in subsequent operation. But excellent as these results may be, the final test is one not merely of thermal efficiency, but of commercial efficiency—not merely pounds of coal per unit generated, regardless of the price and quality of the coal used, but the all-in fuel cost per unit generated.

It is well known that while some station engineers maintain that the higher grades of washed and graded coal are the more economical, others prefer the relatively low-grade untreated rough slack which offers the greater heat value per unit of cost; but it is also common knowledge that for very weighty reasons, such as output and thermal results, many engineers are unable to avail themselves of the undoubted economy of the cheaper low-grade fuels.

The Barton Results.

The figures [see table] deduced from the published results obtained at Barton with a mixture of 46·6 p.ct. of comparatively cheap untreated mixed coal slack (10,880 B.Th.U. per lb.) and 53·4 p.ct. of (presumably) still cheaper coke breeze, are therefore of fundamental importance.

From these test results, it will be observed that while the Sandwich system fully maintains the normal output and thermal efficiency of the boilers, the financial result, due to the relatively low price at which coke breeze is generally available, should also be substantially in its favour.

Contrast with Pulverized Fuel.

That coke breeze so employed facilitates the use of low-grade coal slack has been proved by the reports of several station engineers; but the use of these fuels—unprepared and undried, and, indeed, untreated in any way, except perhaps screening to recover from them the last vestige of "nuts" for other and better purposes—tends irresistibly to throw the "Sandwich" system into sharp contrast with the pulverized coal system, and the much advertised results obtained thereby. One of the best results with the latter system has recently been obtained at the new French (Comines) super-station. Under test conditions and normal conditions of working, efficiencies (according to published figures) of 84 and 80 p.ct. respectively were obtained.

Comparative Test Results.

	Mixed Bunker Coal.		Coal and Coke.
	Normal Load.	Overload.	Sandwich System.
Water evaporated per hour, lbs.	110,593	123,208	105,664
Feed water, ° Fahr.	277	283	279
Rise in temperature, due to economizer, ° Fahr.	77	84	75
Steam pressure, lbs. sq. in.	370	370	372
Temperature of saturated steam, ° Fahr.	441·5	441·5	442
Temperature of superheated steam, ° Fahr.	677	697	663
Fuel per sq. ft. grate per hour	27·8	32·3	27·5
Water evaporated per lb. of fuel as fired, lbs.	7·76	7·45	7·5
CO_2 at boiler outlet, p.ct.	13 6	13·7	13·7
Calorific value of fuel as fired, B.Th.U. per lb.	10,883	10,930	10,590
Hydrogen content, p.ct.	4·03	4·08	2·4
Efficiency of unit—grate, boiler, superheater, economizer, and air-heater, p.ct.	85·6	82 6	84·2

The results realized with the "Sandwich" system not only rival those obtained with the most recent pulverized coal installations, both thermally and commercially, but, whereas the latter method uses coal in its raw state, the "Sandwich" system provides for the recovery of the gas and bye-products of at least 50 p.ct. of the fuel used at power stations.

The thermal efficiency obtained in normal circumstances by means of the "Sandwich" system is at least as high as that of the pulverized coal system; but from the national economic view-point, the former is to be preferred, because it not only renders the recovery of bye-products possible, but the expensive pulverizing of the fuel (which is stated to cost anything from 1s. to 5s. per ton) is rendered unnecessary; and, moreover, the range of choice of fuels is extended to include high-temperature coke, whereas, with the pulverized fuel system, the use of an alternative fuel in solid or liquid form becomes impossible.

Possible Improvement.

The results obtained at the Barton power station are highly gratifying to all concerned; but it would appear from the flue gas analyses given that the advantages rendered possible by the "Sandwich" system of fuel blending have not yet been fully realized. The low hydrogen content of the blended fuel, compared with that of the raw coal, should in practice render possible a material reduction in the amount of excess air used, with a corresponding increase in furnace temperature and thermal efficiency.

THE NEW FLOTATION.

Electric Light and Power Contracts Finance Corporation, Ltd.

It is anticipated that the Government electricity scheme will provide a large amount of work for electrical plant contractors; and the active spirits at 43, Cannon Street, have not overlooked the fact. As we pointed out last week, simultaneously with the Premier's announcement as to the Government electricity scheme, out came a prospectus of the Electric Light and Power Contracts Finance Corporation, Ltd., with the Baronet Soame as the headlight to the Board, and some other persons whose names are now well known on the directorate.

The prospectus is a work of art in respect of finance, and of the glorious hope it tries to generate in the minds of those greedy for big earnings on investments. The capital offered is £25,000 6½ p.ct. first mortgage debentures at 95 p.ct.; 11,350 8 p.ct. (tax free) preference shares of 10s. each at par, and 19,667 8 p.ct. participating premium (tax free) notes of £1 each at par (redeemable at 110 p.ct.). The security for investors is nowhere traceable in the prospectus; no tangible assets or anything. It is all painfully green, and is intended for people who can be classified under the same colour. The attraction by which it is hoped to secure their money is found in the second paragraph of the prospectus. After paying the fixed interest on the debentures, dividends at the rate of 8 p.ct. per annum will be paid to the holders of preference shares and premium notes; and then the remaining divisible balance of net profits (after setting aside 25 p.ct. towards a note redemption fund) is to be applied as to a further 10 p.ct. thereof among the holders of the premium notes, and 65 p.ct. among the holders of the founders' shares. The beautiful prospect may fade away—"may" expresses doubt; we are pretty confident it will do so.

Apparently the Company are looking for good employment for their brains and any money that may be invested in a concern which has nothing to show to justify its existence excepting the passing of the "recent" Electricity Act (we do not know the Act), and the expectation of participating in the schemes, involving the expenditure of millions of pounds, that are in progress in many parts of the world. Good! It is pointed out that the successful results achieved by existing electrical construction and cable companies are well known, and are reflected in the substantial dividends paid on such securities and in the premium at which they stand. That is more than the 43, Cannon Street promoting group can say of a goodly number of their launchings. In black type, it is stated that "the Corporation has an interest in an important plant invention for the production of power for generating electricity in bulk." We seem to recognize this as a statement which has done service before for the 43, Cannon Street promoters. "With such plant, electricity can be produced, as regards fuel cost, at $\frac{1}{10}$d. per unit for light, and $\frac{1}{2}$d. per horse power for power. . . . This high efficiency is made possible by the fact that the bulk

of the whole cost of treatment and production of power is nearly covered by the selling value of the readily saleable bye-products in universal demand obtained in addition to power by this process." It is a long time since we read a somewhat similar statement from 43, Cannon Street; but nothing has so far materialized. The Government ought to be let into the secret of this wonderful invention so that they can incorporate it in the national electricity scheme! By the way, we notice that the 43, Cannon Street address has been kept out of the prospectus, save in connection with the name of Thompson, the solicitor to so many of the companies that have emanated from that quarter, and who has been elevated to membership of the Board of the present piece of company promoting. The registered offices on this occasion are at County Chambers, Corporation Street, Birmingham. We have seen a few silly and weak prospectuses issue from the 43, Cannon Street group. This one matches the worst of them, although dated from Birmingham, where the inspiring voice of the Premier was recently heard delivering his sketch of the Government electricity plans.

NOTES ON NEW BOOKS.

ENGINEERING EXPERIMENTS.*

Two months ago, Vol. I. of "Laboratory Experiments for the Engineering Student," by H. Threlfall, Engineering Lecturer in the Municipal College of Technology, and in the Victoria University, Manchester, was published (see "JOURNAL" for Nov. 11, 1925, p. 347). Vol. II., which contains a series of experiments selected with a view to meeting the requirements of students preparing for the intermediate and final stages of most degree courses in engineering colleges, and for the examinations for the Higher National Certificate, has now appeared. The subjects dealt with include: Work done by "live" and "dead" loads, friction, viscosity, efficiency of parts of a machine, vibratory motion, energy of rotation, rolling motion, pendulums, flow of water, strength of materials, whirling of shafts, efficiency of heat engines and motors, and general problems connected with heat and heat engines. There can be no doubt that a student who has worked through even a portion of the experiments given in the two parts of this book will have received a training, on the experimental side, which should fit him for later work in research. He will have learned as the result of his own experiences how far theory will carry him; and the habit of mind engendered by putting his theory to constant trial should obtain for him that necessary capacity of being able to weigh evidence.

* "Laboratory Experiments for the Engineering Student," Vol. II., by H. Threlfall, F.R.C.Sc.I., M.Sc. Published by Chapman & Hall, Ltd., London; price 4s. net.

THE PURPOSE OF EDUCATION.*

The Cambridge University Press have published the fifth edition of this book, which is an examination of educational problems in the light of recent scientific research. It has, perhaps, no immediate interest for gas engineers *qua* engineers, but the problem is such a general one, and its treatment in this volume so fascinating, that all thinking people will benefit from its study. As the result of psychological investigations, many modifications have been made in methods of education. St. George L. F. Pitt's book will enable the general reader to appreciate what has led to change of thought regarding education. The problems discussed include human personality, emotion, and instinct, incentives to effort, specialization, multiplex environment, ideals, and inversion; and there is a note on determinism. The literary quality of the work is of a high standard.

* "The Purpose of Education," by St. George L. F. Pitt. Published by the Cambridge University Press; price 4s. net.

FORTHCOMING ENGAGEMENTS.

Jan. 29.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at Westminster Technical Institute.

Jan. 30.—SCOTTISH JUNIOR GAS ASSOCIATION.—Visit to the Kyle Chemical Company's Works at Irvine.

Feb. 3.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION and YORKSHIRE JUNIOR GAS ASSOCIATION—Visit to the Stretford works of Messrs. Parkinson & Cowan (Gas Meters), Ltd.—2.45.

Feb. 9.—NATIONAL GAS COUNCIL.—Meeting.

Feb. 9.—FEDERATION OF GAS EMPLOYERS.—Meeting.

INSTITUTION OF GAS ENGINEERS.

Feb. 9.—ADVISORY COMMITTEE ON EDUCATION.—4 o'clock.

Feb. 10.—EMERGENCY COMMITTEE.—11 o'clock.
FINANCE COMMITTEE.—12 o'clock.
COUNCIL.—2.30 p.m.

CENTENARY CELEBRATIONS AT WALSALL.

Carbonizing Plant Extensions Inaugurated.

On Monday of this week an important stage was reached in the history of the gas undertaking of the County Borough of Walsall; for then was celebrated the centenary of gas supply within the borough—this event appropriately coinciding with the inauguration of new carbonizing plant at the Pleck Gas-Works. A description of this scheme of extension must be held over until our next issue, when we shall be giving a general account of the day's proceedings; but meanwhile it may be said that the Gas Committee, after much deliberation, decided to take the advice of their Engineer and Manager (Mr. Fred Davies), and to put down a horizontal installation as nearly up to date as the circumstances and site of the operations would permit, rather than to extend the vertical plant already in existence.

The proceedings of the day opened with an official welcome in the spacious and well-appointed Council House by the Mayor of Walsall (Councillor D. E. Parry), to whom thanks were expressed by Alderman J. H. Lloyd, M.A. (the Chairman of the Birmingham Corporation Gas Committee); both gentlemen recalling interesting facts in connection with the early history of gas supply in Walsall. Then followed (after the formal starting of the new plant by the Chairman of the Gas Committee, Councillor J. A. Leckie) an inspection of the Pleck Gas-Works, and particularly of the new carbonizing arrangements, everything in connection with which was working with pleasing smoothness.

A luncheon in the Council House was attended by a large number of guests, including some neighbouring gas engineers. Councillor Leckie was in the chair; and among the other speakers were Mr. W. Preston (Borough Member of Parliament), Mr. J. Ferguson Bell (Derby), Mr. W. M. Mason (Manager of the "B.C.G.A."), Mr. J. W. Broadhead (Managing Director of Messrs. Robert Dempster & Sons, Ltd.), and several members of the Council. Walsall possesses a successful gas undertaking—in fact, more than once the Chairman made use of that well-understood term "milch cow"—and generous acknowledgment was made of the managerial services which have so largely contributed to that success. In this connection, three names were mentioned—Mr. J. Tindall, Mr. B. W. Smith (who occupied the position of Engineer and Manager from 1900 to 1923, when he retired), and Mr. Fred Davies. Reference was also made to the satisfactory manner in which the contractors had carried out their work.

The final item on the programme was the official opening of the Gas Centenary Exhibition at the Baths. This ceremony was to have been performed by Mr. F. W. Goodenough, C.B.E., but to the regret of all, important business prevented him from leaving London. His place was filled by Councillor Leckie, who referred with pleasure to the honour that has lately been conferred upon Mr. Goodenough, in recognition of his work at Wembley. In seconding a vote of thanks to Councillor Leckie, Mr. Mason emphasized the importance of smoke abatement and the value of gas from the labour-saving point of view. In the exhibition an excellent assembly of modern appliances should do much to increase the business of the Gas Department.

Insulation of Gas-Fired Apparatus.

Reduction in fuel consumption is but one of the ways in which savings worth while are effected by the use of adequate and proper insulation. Generally, said Mr. L. E. Cover, of the Armstrong Cork and Insulation Company, of Pittsburgh, in a paper read before the American Gas Association, the main consideration is the result produced by confining the heat generated to points of maximum effectiveness. The qualities essential in an insulating material suitable for gas-fired apparatus of all kinds are: (1) Low heat conductivity at the temperature employed; (2) convenient form for handling and installing (such as block or brick); (3) structural strength; (4) ability to withstand high temperatures; and (5) reasonable cost. There are many excellent insulating materials for gas-fired equipment offered on the market to-day that meet these requirements. The basic material used in the manufacture of many of them is diatomaceous earth—a marine deposit composed of the shells of minute organisms called diatoms, which existed ages ago. This material is practically pure silica, and possesses an exceptionally high heat-retarding value. To obtain a convenient form for handling and installing (block and brick form), and also to eliminate the layer formation or cleavage planes of the natural earth, the raw material is pulverized, and either mixed with finely ground cork, moulded into brick form, and fired, or mixed with long South African blue fibre asbestos and a binding material, and moulded into blocks of various thicknesses and sizes. In either case, the manufacturing process gives the finished products uniform strength in all directions, enhances the insulating value of the basic raw material, and makes available for convenient and economic use one of Nature's remarkable insulating materials—diatomaceous earth. Applications of both these forms of insulation to gas-fired industrial equipment are legion.

COKE COMPETITION PAPERS

Which obtained the Ten-Pound Awards in Section III.

(*Continued from p.* 160.)

COKE BOILERS.

By "COMFORT AND ECONOMY."

[G. G. CHAMPION, 8, Brookview Road, Streatham, S.W. 16; and R. G. MINNION, 60, Stanley Road, Woodford, E. 18.]

We maintain that the policy to be adopted is that of stimulating the domestic sales, which, of course, return the best prices, and of transferring coke from the export and steam-raising markets to meet the demand as it grows, until eventually most of the coke made is bought by the private consumer.

In the domestic trade the possibilities of improvement appear to be almost unlimited. Already in London considerable progress has been made in popularizing the use of coke in private houses—mainly by the introduction of boilers, both for central heating and hot water supply. There are to-day at least fifty firms in the kingdom making hot water boilers for private houses; and at any rate three, to our knowledge, are accounting for 100 a week. But let us be conservative, and say that altogether 500 are being installed weekly, or about 25,000 a year. Each boiler requires anything from 4 to 10 tons per annum; and this means that the possible coke demand is being increased by a minimum quantity of 100,000 tons a year in the best paying market of all. The point we wish to emphasize is that this increased demand is due entirely, or almost entirely, to the boiler makers themselves. Obviously, therefore, with very little help from the gas companies this figure of 100,000 tons could be doubled at once, and with a determined effort could be trebled.

First, and most important, is the question of quality. It cannot be too strongly emphasized that unless coke of a low ash content and of a reasonable moisture content be consistently produced, the hard work of the salesman will be largely discounted. Of course, in order to keep ash content low, more money must be paid for coal. This is undeniable; but so is the statement that the price of domestic coke could be kept at such an enhanced level that whatever extra amount was paid for the coal would be off-set, and possibly more than off-set, by the additional price obtainable for coke. Further, it is important to remember that poor coke brings complaints from customers who are also gas users, and that they inevitably, though possibly rather unreasonably, extend their grievance to the company in general. We cannot afford to lose the goodwill of anybody; and a coke order may quite conceivably be the prelude to a gas order. With regard to moisture content, we ask for 5 p.ct. as a maximum figure for the larger sizes of coke, which figure should not be increased by more than 1 or 2 p.ct. for the smaller sizes.

The point next in importance is that of grading. The care taken in securing good quality and low moisture content can be altogether wasted by careless grading. There should be four grades:

(1) From 2 in. upwards (large).
(2) 1 in. to 2 in. (broken).
(3) ⅜ in. to 1¼ in. (coke nuts).
(4) ⅛ in. to ⅜ in. (forge coke).

The two smaller sizes should be washed to eliminate dust and slate (the latter should not be present in any quantity, if the coal be right), thus avoiding trouble of clinkering. If these grades be carefully maintained, the customer taught which to order, the quality kept high, and the moisture content kept low, the essentials are secured; and we can go on to consider methods of selling the coke in this particular market.

With regard to boilers, there is now a splendid field of selection; and the makers are most energetic in their propaganda, and in their efforts to supply the most satisfactory article. The tendency is to make sizes smaller than ever, and this in turn means smaller coke to supply them. A considerable strain on the grading facilities of some companies must be looked for; and, if their plant will not cope with the demand for 1 in. or even ½ in. coke, we suggest coke cutters. These are, of course, expensive; but it will pay better to instal them and continue to stimulate the domestic trade, than to sell all the coke as made direct to steam raisers at low prices. It is true that this means making more breeze; and when waste-heat boilers become more largely used, the disposal of breeze must be considered. Yet by grading coke as low as ⅜ in., much of what is now sold as breeze becomes coke; and we think the "Sandwich" system, in conjunction with the electric power stations, may be confidently looked to to deal with the balance. It is noticed, too, that at present many nurserymen and laundrymen are burning breeze very satisfactorily; and there is no reason why their number should not be indefinitely increased, if the necessity should arise.

Another word as to grading. A small company, whose demand may become at times larger than the supply, should come to some arrangement with a neighbouring company to enable them to avoid disappointing customers—a process which does incalculable harm to what must be regarded as almost an infant industry.

The chief obstacle to the more general use of coke boilers is the heavy cost of installation. The cost of a boiler will in most cases be within the customer's means; but the additional charge of (say) £10 to £15 for installation often makes it quite prohibitive. The offer of a discount on the current price of coke after the boiler is bought is not nearly enough. Such a discount will only save the customer a few shillings annually; while on the total sales the company will lose a considerable sum. The real need is for a reduction in the initial outlay; and we suggest that the companies should offer to instal all boilers at cost price in return for a pledge from the customer that only coke would be used. The company would lose nothing, and the customer would gain considerably. The hire-purchase system should also be invoked as an additional attraction. We should like to mention here an interesting suggestion recently made by a coke customer who had installed two boilers in his house—one for hot water, and the other for central heating. The results were all that could be desired, and he wishes others to share the same benefits; but the cost of installation was mentioned as a deterrent from this step. "Why," he asked, "should not the gas companies form a subsidiary company for the express purpose of fitting central heating boilers on a hire-purchase system, and obtain a financial grant from the Government under the Trade Facilities Act? This company would fix the boilers on reasonable terms. The iron trade would materially benefit, and unemployment be reduced; houses would be rendered more comfortable; coke sales would be increased; and the health of the community would be greatly improved by the elimination of smoke." Such a scheme requires very careful examination, as many objections to it could be found; but it shows that public opinion is dissatisfied with the present systems of heating.

Before leaving the subject of household coke, mention must be made of the open grate, the kitchener, and the anthracite stove. While many people are quite ready to adopt coke, various objections are raised, among them the following:

1.—Difficulty of lighting without the use of coal.
2.—Big residue.
3.—Necessity of constant stoking.

It is obvious that more wood or other kindling material is required than with coal, and the obtaining and storing of a sufficient quantity of wood and coal in addition to the coke is a nuisance, and sometimes a difficulty. Would it not be possible to introduce a gas fire-lighter that would be presentable in appearance and easily fixed and detached? An ugly piece of gas pipe will not commend itself to the housewife; but if a good-looking article can be made available, it should become popular—and incidentally another avenue would be opened for the supply of gas.

The second objection would be largely overcome by the considerations as to quality already mentioned. The third must be met by coke-burning grates of better design than have been made hitherto. Good as some of them are, we do not think it will be long before a better article appears on the market. It may be remarked that coke from vertical retorts makes an admirable fuel for burning in open grates, kitcheners, or anthracite stoves; and where more than one kind of coke is available, due regard should be paid, when supplying, to the purpose for which it is required.

With regard to the use of coke in anthracite stoves, it is obvious that excellent results and great economy can be obtained by making clean ½ in. or 1 in. washed coke available; and already we see that a large number of possessors of these stoves now burn nothing but coke. Two of the largest makers of anthracite stoves in England are already recommending their customers to use coke.

Finally, we think that the gas companies should regard this matter in a national way, and realize that the selling of a ton of coke in Yorkshire will help the position in London. District and county organizations should be formed on the lines of the London Coke Committee, who have already succeeded in increasing sales to a considerable extent in London, and by their propaganda are helping companies all over the kingdom. Their boiler advertisements must bring inquiries from all parts; and there is no doubt that provincial companies are sharing in the benefits. The country should be divided into zones, each with its Coke Committee. Each company on the Committee would pay a subscription according to its size, to pay for office expenses, advertisements, and the services of a fuel expert, who would be at the disposal of all in pushing sales. Delegates from each Committee could then attend a Central Organization (possibly the National Gas Council) once a year, or more, when

suggestions as to improving the sales of coke all over the country could be considered. By this means we should get complete co-operation without any suggestion of interference with the right of any undertaking to govern its own affairs or to fix its own prices.

COKE CO-PARTNERSHIP COUPONS.

By "CO-PARTNER."

[EDWARD F. KEABLE, Engineer, Manager, and Secretary, Gorleston and Southtown Gas Company.]

THE PROBLEM.

The real problem is how to build-up and foster a steady demand from our works as far as possible all the year round, or at least to enable the stock carried to be within the limits of yard storage without resort to expensive handling. Looking at the matter generally, one is, of course, aware that there are many outlets for large quantities of coke for industrial purposes; but for the purpose of this paper, I wish to assume that these channels have already received due attention, and still large stocks of coke are present on almost every hand.

These are a grave menace financially, and, further, are a source of grievance when, as so frequently is the case, they are dumped by large undertakings into smaller areas. Our problem is immediate; for if these stocks are once allowed to be the lever for a rapid fall in prices, it is obvious that, with the price of coal at a low ebb, coke values will be a long time recovering the position they have a right to demand as smokeless fuel. If allowed to take place, it can only end in the price of gas being increased, or in the maintaining of present prices for a longer period.

Large outlets for coke for industrial purposes are in many ways desirable; but industries are liable to fluctuations.

DOMESTIC CONSUMPTION.

This brings me to what, in my opinion, is the solution to our problem, taking the country as a whole. I refer to domestic consumption. We have passed through coke surpluses before, but never previously was such a quantity in view—due, we are pleased to note, to the ever-expanding needs for gaseous fuel. The factors which, during recent years, so to speak enveloped us in a fool's paradise, have somewhat suddenly passed away; and those undertakings which have neglected their domestic outlets, are the ones which must suffer most until such business is regained.

It is the hope of all that our great industry will penetrate into fields yet unthought of; but the marketing of coke must ever be a live factor in the scheme. The question, therefore, is, "Can this happy state of affairs become possible?" I am pleased to think that the answer is, "Yes, if we are prepared to put in the work needed to get our article placed." Solid experience is worth much theory. I therefore quote from same; and perhaps to add some force to my remarks, it will be advisable to state facts which are not outside 1925.

In the previous autumn (in accordance with our custom), we placed in the hands of all our slot consumers the following leaflet:

GAS COKE.

Coke can now be obtained as in pre-war days in quantities of ½ cwt. and upwards, at the rate of 2s. per cwt., at works.—Delivered 2s. 2d. per cwt.

As coal will undoubtedly become dearer in the winter months, avail yourself of this opportunity

NOW, WHILE STOCKS

ARE AVAILABLE,

to replenish your fuel supply for the winter months at the price now obtaining.

For hot glowing fires, use coke mixed with coal. Coal and coke used in this way are more economical than coal alone.

Try it, and you will agree.

The result this year exceeded our anticipations; for, to express it in a few words, the demand caused by this means of personal contact doubled itself. By consistently backing such appeals with the best article we are able to turn out, we have not found it necessary to send out of the town one ounce of coke for many years past. It is a true saying that there is, after all, nothing new under the sun; and no doubt at one time or another every possible method has been pursued. But what we really need for our industry is a solid foundation on which to build a scheme that will not only last, but will allow for the large expansion of our business, and still remain equally operative.

CO-PARTNERSHIP.

How many of our gas consumers have any adequate conception of the relationship between income from residuals and the price of gas they consume? Is this our fault or theirs? The answer must surely be that it is our own. Up to now we have been able to get round our smaller difficulties without taking our consumers into our confidence.

THE CARDS ON THE TABLE.

Surely the time has come when we should make a frank statement to them, pointing out the close connection between the two subjects; and, having thus educated them, invite them to become co-partners in a common attempt to get for our coke a fair and steady price, they in turn understanding that such help could only lead to one end—*i.e.*, cheaper gas. While perhaps there is nothing startling in this suggestion, it may be counted as a new peg on which to hang an idea that has proved its worth in other fields.

Let the position be conveyed to each consumer (slot and ordinary), say by a carefully worded circular-letter; and having succeeded (as I am sure would be the case) in establishing a new and strong point of contact, it would be comparatively easy with such an atmosphere to persuade most consumers to do their share in the scheme. If we look at our total number of gas users, and then consider our available coke for sale, what does it amount to when expressed in hundredweights of coke per consumer per annum? We must all realize that it is a small figure.

CONSUMERS PARTICIPATE IN RATIO TO THEIR GAS CONSUMPTION.

To make our appeal along the lines of co-partnership more effective than has been so far indicated, I would suggest a few conditions, which are as follows:

(1) That our available coke supplies are first held at the disposal of our own gas consumers (for they are surely our best friends).

(2) That a consumer who uses gas for lighting, cooking, and heating should have the lowest rate of all. (This would make a strong appeal to slot consumers; and most of them would come under this heading.)

(3) Then should follow a higher rate for those who use gas for cooking and heating only.

I would suggest that each gas consumer be given a coupon of some kind, which could be known as the Coke Co-Partnership Coupon, and that upon presenting this at any time the special rate in force for such consumer be available.

In addition to stimulating a keen interest in our smokeless fuel, it is easy to see that we should reap other rewards also, because the more times in a year we can come into vital contact with those who furnish our revenue, in rendering service, the greater will be our chances of fostering mutual confidence and goodwill—which, after all, is the foundation of lasting business. In appealing to our consumers, we should, of course, emphasize all the domestic and national advantages attending the use of coke. We are all agreed that the domestic chimney is the greatest sinner in the matter of smoke pollution; and it is clear that if we can get coke into use in our domestic grates, either alone or mixed with coal, we shall have gone some way towards our ideals.

COKE FOR DOMESTIC HEATING.

Some time ago Prof. C. V. Boys, F.R.S., gave us the benefit of his practical experience over a number of years of the successful burning of coke in domestic grates. This advice caused us to put it to the test, through the Chairman of our Company. First one grate was altered (at a small cost). This at once proved quite up to expectation; and several more were converted in the same way in different parts of the house, with equally good results. Having thus proved that this was a cheap and ready means of converting grates for the use of coke, we have prepared a leaflet which we shall now place in the hands of all likely consumers.

STRIKE WHILE THE IRON IS HOT.

It is clear to all observers that the smoke nuisance is becoming more and more a live topic of national interest; and it was a pleasure to read an important article in the "Daily Chronicle" from the able pen of Dr. Leonard Hill. This is only one of many indications of modern thought in this matter. Therefore, if we push the advantages of our smokeless fuel with all the energy at our disposal while such appeals are before the public eye, the harvest can only be what we, as producers, and the gas consumers desire; and if the impetus is exerted along the simple channel I have sought to indicate, it will not be long before our industry will be on happier grounds.

If we will, the desired issue is in the hands of every undertaking without any material alterations in present methods; and, what is equally important, the scheme herein outlined could be made effective in a reasonably short space of time.

ADVERTISING OUR STRONG ALLY.

We have recently witnessed large strides made in placing, in ever-increasing quantities, commodities which we were accustomed to consider as commonplace. Take, for example, the "Eat more Fruit" campaign, and "Eat British-grown Tomatoes." These articles of food have been at our command for many years, and it might have been considered, by minds whose range of vision was short, that the public were fully alive to their beneficial uses. The bold advertising campaigns of far-seeing men have proved that such was not the case. It required the old knowledge presented in a new form, in order to catch the public eye; and the result has been an abundant harvest.

The Law of Suggestion is a strong force, and if we can push our smokeless fuel by (say) "Get the Coke Habit," we also shall succeed. If we couple with suggestive advertising

the added lever of co-partnership, we must all agree that our chances of ultimate victory over present circumstances will be greatly enhanced. The work done by the London Coke Committee is surely proof of this contention; and, further, the recent pushing of sales for the use of coke in independent coke boilers as economical and labour saving is on sound lines. We cannot, however, expect this, in the present state of general finance, to have any immediate influence on our stocks, owing to the reluctance of most people to incur the initial outlay; but once we get our consumers on the road to the "Coke Habit" by utilizing existing or slightly modified grates, and by having proved the superiority of our article, it will be much easier to get new appliances considered in more prosperous times.

The field is unlimited, and therefore all that is needed is to "get busy."

COKE AS DOMESTIC FUEL.

By "DANTE."

[H. J. HODSMAN, of 2, Norwood Grove, Victoria Road, Hyde Park, Leeds.]

ALTERNATIVE MARKETS FOR COKE.

The total production of saleable gas coke in Great Britain for the year 1923 was 7,542,000 tons, and the quantity exported was 1,224,000 tons. The exportable surplus may be greater now, for reasons which are well known. On the other hand, it is estimated that the British consumption of coal for domestic purposes reaches 35,000,000 tons. Obviously, a relatively small turnover of householders from coal to coke would wipe-out the surplus of coke, and recall the days when gas coke was in demand and prices were high. The domestic market is, therefore, one which will not readily fail on account of saturation, if the user can be given satisfaction. This is the field to cultivate, if good returns are to be obtained for coke, and, as a consequence, the price of gas is to be correspondingly reduced.

Moreover, it is in the public interest, in a land suffering so much from smoke, that carbonized fuel should be consumed at home to the greatest extent practicable.

Public interest, then, as well as that of the gas industry, urges that gas coke should go into domestic consumption. Here is a market characterized by steady consumption and the best prices, largely independent of foreign markets and trade conditions—a "sheltered" market, to use a term of the politicians.

FORMER NEGLECT OF COKE MARKET.

There is no doubt that, with exceptions, the coke market has been largely neglected. Whereas the greatest energy has been put into the manufacture and sale of gas and of gas consuming appliances, no corresponding effort has been put into the sale of coke and coke consuming appliances. This is probably truer of the North than of the South of England. There has even been hostility among gas salesmen, and the fear that coke would encroach on the field for gas. How rarely has one seen a coke-burning appliance in a gas undertaking showroom, or in an exhibition of gas apparatus? It must be granted that the credit for bringing coke appliances to their present degree of perfection and use is due to the efforts of manufacturers rather than to any encouragement of the general body of the gas industry. And yet the coke plays a part in the balance-sheet second only in importance to the gas itself. Until the ideal of complete gasification becomes general practice, this must be so; and as the gas consumption grows, the coke problem might become more acute.

In domestic practice exists a large potential market for coke where there is little prospect that gas at the present time will be used at all. Living, as we do, in a cold, damp climate, we need, in the winter season, ample artificial heat. Much can be done with a fuel at 1d. to 2d. a therm which cannot be attempted with gas at 7d. and upwards. In the family life of small households, keeping normally one fire, this must burn all day, and such consumers will not contemplate using anything but solid fuel. The saving of labour does not enter into the question; for no domestic help is employed. These people now burn coal; and no adequate effort is made to furnish them with appliances adapted to burn coke, or to show them how to get the best results with it.

Frequently, the use of gas for cooking has been restricted because the consumer believes a coal fire essential to supply domestic hot water, and he will not contemplate water heating by gas. It may fairly be said that gas for cooking and coke for water heating are complementary and mutually helpful. Moreover, like cooking, domestic hot water is an all-the-year-round requirement, whereas central heating is confined to the winter months only. The writer believes that the lukewarmness, and still more the hostility, of gas salesmen to pushing of coke sales is a mistake. The market for coke must be developed alongside that for gas. The development of the use of coke for central heating may pave the way for still greater sales of gas. In America, to save labour, trouble, and dirt, central heating installations are being increasingly fired with automatically regulated town gas.

GAS COKE AS FUEL FOR CENTRAL HEATING.

So fas as the technical side is concerned, little need be said as to the suitability of gas coke for use in central heating installations. Gas coke, as now available, is eminently suited to be consumed in such boilers, usually of ample size; and it may be fairly claimed that in this respect the consumers' requirements are adequately met. No case can be made-out for the superiority of coke from other sources, or produced by other methods of carbonization. Volatile matter has no merits in closed fires. Commercially, the position is not so secure; for coke prepared in the coke oven may be quite suitable for this purpose—a fact which the coke oven proprietor has not overlooked. Indeed, bye-product coke has been regularly exported for this purpose. Now that the market for metallurgical coke is restricted, collieries are even breaking-down and grading bye-product oven coke for the home market. Thus, while there is no doubt that central heating is becoming increasingly adopted, it is also clear that gas coke will have to face growing competition in this market from the bye-product oven coke. In this field the range of fuels which can be consumed is relatively wide; and it is difficult to claim a special advantage for gas coke.

COKE AS FUEL FOR INDEPENDENT COKE BOILERS.

A variant of this application is the use of the independent coke-fired kitchen boiler, which is becoming increasingly popular as a source of domestic hot water. Good gas coke now available is a fuel inherently well suited for use in such boilers; and, indeed, it may be claimed with some right to be the best fuel for the purpose. The requirements are, however, more stringent. The boiler will usually be smaller in size than those used for central heating installations, and it will frequently have to stand in a kitchen or living room. This has important consequences.

It is desirable that such a boiler shall be in continuous operation, because the re-lighting of the fire, being more troublesome than the lighting of an open coal fire, is preferably done as rarely as possible. This is all the more desirable, because lighting may be a dirt-provoking operation, and the boiler may be in a living room. It is important, then, that the fire shall be capable of burning over-night (ten to twelve hours) without attention—that is, without becoming extinguished on the one hand, or without causing the water to boil on the other. With the small fuel bed usual in such boilers, these requirements are somewhat stringent; for the latitude between a rate of combustion which will just maintain the fire and one which will cause the water to boil is narrow. To get over this difficulty, it is essential that the coke be rightly graded for the job.

To meet these requirements, the coke will have to keep at a dull red heat only, and little above the temperature of ignition. The coke must necessarily be so sized that the fuel bed has a close texture, so as to prevent the rapid flow of excess air through it, which may chill the fuel below the temperature of ignition. Large-sized fuel is entirely unsuited. Indeed, the best results have been obtained with coke breeze passing between a 1 in. and a $\frac{3}{4}$ in. riddle, though provided that there is sufficient small stuff the upper limit may be placed higher. Too much dust is undesirable. The provision of coke of the right grade is most important, if such boilers are to give satisfaction. Yet the writer has known such a boiler to go out of use because the local gas undertaking would not supply suitably graded fuel. The consumer cannot reasonably be expected to break-up lump coke within his house.

The ash content of coke is not a serious difficulty in such a closed domestic boiler, so far as combustion is concerned. Indeed, it may help to moderate the rate of combustion of the coke. The ash has to be removed daily; and it is therefore desirable to provide means to do this with a minimum of trouble and dirt. The boiler should preferably be so designed that the ashes can be collected in a removable ash pan below the firebars, so as to minimize the need for shovelling and handling the fine ash. The importance of this in a living room needs no emphasis; and the importance is greater with independent boilers than when a fire lies under an open chimney flue. In some designs met with, the manufacturers have given insufficient attention to this point.

Such a boiler has been in use in the writer's household for several years, burning continuously (holidays excepted); and reference to the coke bills shows that the over-all consumption averages a little over 1 cwt. per week. Reckoning the cost of coke at 1s. 9d. per cwt., a continuous supply of hot water for a household of five is obtained for 3d. to 4d. a day. Moreover, such a boiler makes an excellent destructor of kitchen and other refuse, the disposal of which is a real difficulty in an all-gas house. Although the gas industry is able to offer such excellent value for money, it appears to be scarcely aware of the fact. Gas undertakings do not sufficiently exhibit such boilers in their showrooms, or take, in many cases, adequate steps to supply suitable coke.

INDEPENDENT BOILERS WITH OPEN FRONTS.

The above remarks relate to a totally enclosed boiler, whereas some householders insist on a visible fire in a kitchen. Manufacturers have met this demand by providing boilers with fronts which may be let-down to furnish an open fire. Naturally, the fuel consumption will be higher than that stated above, but still eminently reasonable, considering the duty performed. It is this form of appliance to which one must turn when it is desired to encourage the use of smokeless fuel—coke—in the

kitchen-living room where a fire must burn continuously. Such householders must be tempted to accept the convenience of an ample hot water supply in compensation for what may be regarded as the sacrifice of a coal fire. Manufacturers have gone further in developing this type by the combination of an oven with the coke-fired boiler. Doubtless with care such appliances will give good service; but without that care, the writer imagines that they will prove less satisfactory. Against the convenience and flexibility of the gas cooker, it seems unlikely that they will prevail; but in the meantime they will serve a useful purpose—either when gas is not available or where solid fuel cooking is insisted upon.

A case falling within this category is the farm house, where the coke-fired boiler, with or without oven, should be very successful. On the farm, for dairying and other purposes, an ample supply of hot water should be invaluable, if not absolutely essential; and yet how few farm houses are so provided. The customary arrangements are most primitive and wasteful of fuel; and to an outsider it seems hard to understand how the proper cleaning of dairy appliances can be achieved with the means at disposal. This is an outlet for coke usually entirely non-competitive towards gas. Agricultural shows are held regularly, and should present excellent opportunities to advertise the economies of coke firing. The farm may provide other outlets for coke. Much attention is being given to-day to the artificial drying of crops; and it is even proposed to use air heated by oil burners for the purpose. If the use of oil is feasible, there should be a chance for coke; but the distribution of coke in rural districts would be simplified if more compact cokes could be produced.

Coke as Fuel in Open Fireplaces.

So far there has been discussed the use of coke in domestic water boilers—a field for which the coke of to-day, suitably graded, is admirably adapted, and of proved value. This is a market capable of great expansion, if taken up in the same way as the sale of gas. Another and more debatable application is the use of gas coke in open domestic grates. Although it is true that much coke must, even now, be burnt in this way, it is certain that coke is not considered by discriminating consumers as particularly suitable for the purpose. It is commonly regarded as either too difficult to ignite or, when ignited, too sluggish in burning, and in any case too dirty, to be satisfactory. These views have come to be regarded as axiomatic—so much so that in wide circles no solution of the domestic smoke nuisance can be seen, except by creating *ad hoc* new coke-making industries producing types of smokeless fuel which are more or less free from the objections stated. To judge by the apathy of the past, it would seem that the gas industry itself accepts the position as true beyond alteration—that gas coke is a low-grade fuel to be used only by those who must.

In approaching the question of the open fire, one must recognize in the outlook of the general public a most formidable position to assail. We live in a land with a tradition of cheap coal and an ingrained affection for its cheerful blaze in an open fire; and, although it is now beyond serious question that this is the main source of our smoke, even in the eyes of the general public, yet this same public sees no adequate alternative. Moreover, we live in a land where high-class house coal is available. It is possible to-day, for those prepared to pay for the best, to obtain coal with even so little as 2 p.ct. of ash; and such consumers will not readily accept a fuel high in ash. It is idle to imagine that the coal in domestic fires will be displaced by carbonized fuels without great efforts, both technical and educational. At the same time the problem may not be impossible of solution. There is growing interest in the abolition of smoke; and a considerable body of people might be induced to use smokeless fuel if they knew how it could be done with satisfaction and economy to themselves. It is with these that the campaign should be begun.

The writer has tried substitutes for coal, in a common type of barless domestic grate; and it may be instructive to relate these experiences. Samples of fuel prepared by low-temperature carbonization—5 to 10 p.ct. of volatile matter—were first tried. For such coke was claimed the merit of easy ignition. It was, in fact, found that the fuels could be ignited without difficulty in the orthodox manner with wood and paper. The process was undoubtedly slow, and required almost an hour before a lively fire was produced—certainly at least as long as a coal fire. This seems to be a difficulty inherent in carbonized fuel. In lighting a fire with coal, once the volatile matter is ignited the play of flame results in a rapid transfer of heat throughout the mass; and this contributes largely to the ease and speed of the operation. The volatile matter in the low-temperature cokes seemed insufficient in quantity, or too slowly evolved, to play an equally effective part; and completely carbonized fuel such as gas coke displays this shortcoming still more clearly. Heat transfer is dependent upon slower and less effective processes in the incipient coke fire. When a fire of low-temperature coke was once alight, it burned readily, and perhaps satisfactorily from the point of view of a smoke abatement reformer. To the person who craves for the cheerful blaze of a coal fire, the effect would, however, be less satisfying. The volatile matter content of such fuel is so small as to produce but little flame, and that with an almost non-luminous flicker—altogether by no means likely to bring to conversion the old-fashioned lover of a blazing fire.

A Grate for Coke.

It seemed that what was needed was a greater depth of fuel bed than was obtainable with the existing grate. Modern practice in fireplace construction by the removal of front firebars has made it difficult, if not impossible, to have anything but a shallow bed of fuel; and while this may be satisfactory where coal is being burned, it certainly does not facilitate the combustion of coke. A grid of bars was set-up before the fire, so that a fuel bed up to 1 ft. in depth could be maintained; and the position was immediately transformed. It was quite easy to obtain and maintain a bright, hot fire with any kind of gas coke obtainable. The results were so satisfactory that since then no more coal has been used in the writer's household; and the fire has been a frequent source of admiration of those who have seen it. Moreover, from that time the writer has felt that there is no superiority in low-temperature coke commensurate with its greater price. Other fuels have been tried in the fire—such as anthracite, and even Durham beehive coke—and all have been consumed, though not so satisfactorily as gas coke. Anthracite has the disadvantage, apart from the cost, of being brittle; while, of course, it is unnecessary to use oven coke. It was tried merely as a matter of interest.

It seems that in a shallow fuel bed a sufficient flow of air cannot be induced through the coke to maintain rapid combustion, and a consequent high temperature and bright redness in the fuel. This is even true of low-temperature coke. On deepening the fuel bed, one obtains conditions which permit of a sufficiently vigorous combustion, even with gas coke; and given that, there is no occasion to employ the more expensive low-temperature coke. Moreover, a deep-faced fuel bed gives an improved distribution of radiated heat in the room, and, according to Dr. Fishenden, if accompanied by a corresponding reduction in thickness from front to back, an increased radiant efficiency.

It may be urged that there remains the problem of igniting the coke; but surely that is no problem where gas is available. Gas pokers are used in large numbers to light coal fires, and can equally well be used to light coke. The gas pokers as sold at present are not contrived to make the most effective use of the gas burned. The gas, partially aerated, is discharged in the middle of a mass of solid fuel, where it is only imperfectly burned; the combustion being completely above the fuel. It would seem preferable to burn the gas by means of a row of bunsen flames placed in front of the fuel bed, and at its base. Here the flame can become properly aerated, before contact with the fuel to be ignited; and as a consequence the gas is much more effectively used. This may not be so easily carried out with the barless grates popular to-day; but it works admirably with the deep coke grate described above. No one associated with the gas industry need regard the ignition of a coke fire as a serious difficulty. The presence of volatile matter undoubtedly helps in lighting a coal fire; and it is only necessary to harness that volatile matter as gas to attain the same end with coke. As regards cost, the writer does not find it more expensive to use gas for the purpose than firewood, if this has to be purchased; and to light the fire with gas eliminates a job which provokes work and dirt, and consumes time. Dry coke from continuous vertical retorts is not difficult to ignite even with wood and paper. Moisture, however, is always a great hindrance. When lighting a fire, evaporation of moisture absorbs much heat just when the incipient fire has difficulty in supplying it. This absorption of heat delays the rise of temperature of the fuel bed and the consequent development in the fuel bed of the rapid flow of air necessary for active combustion. Even a fire already well established visibly suffers in this way when replenished with wet coke.

It will be gathered from what has preceded that the writer considers that no insuperable difficulty is raised by the difficulty of igniting coke or the production of a bright fire which will be acceptable to all but those who insist on having a blazing fire. After burning some time, a coke fire becomes much less satisfactory, owing to the accumulation of ash. It is true that all solid fuel fires suffer in this way; but in a coke fire the difficulty is accentuated, because the ash of the coal—which too often is excessive to start with—is concentrated in the smaller weight of coke produced. Moreover, where the fuel is to be burnt in an open grate, it will generally be compared with a good house coal—the highest class of coal on the market—it may be with as little as 2 to 3 p.ct. of ash. The consumer in such a case will be inclined to intolerance of a fuel containing perhaps 10 p.ct., if not more, of ash. So long as such coke is to be used in a closed stove, the ash, though undesirable, is not seriously detrimental. In the open fire, it soon spoils the brightness of the fire, so that effective means for its removal from the burning fuel bed are desirable; and when removed the manner of disposal needs consideration, so as to minimize the trouble involved.

Disposal of Ash.

Accepting the high proportion of ash in coke as inevitable for the present, it seems desirable so to contrive the grate as to facilitate clearing the fuel bed of ash while the fire is burning, without creating dirt in a living room. Furthermore, the ash should be collected in a pan, so that the whole can be removed

from the fireplace without shovelling or other handling calculated to stir-up dust. The method adopted by the writer for the purpose was to remove the existing firebars supporting the fuel bed and replace them by a loose grid suitably supported and provided with handles projecting in front of the fire. With these it was possible to shake the grid to a limited extent, and therefore the fuel bed also, so that fine ash worked its way down, falling through the grid into a pan placed below. Lumps of burnt shale gave more trouble; but a horizontal movement of the grid to and fro tends to cause such lumps to work forward to the front of the fire, where their extraction and removal become easy. Fine ash is, however, more easily dealt with than lumps, which are for this reason undesirable. The object of the contrivance was to keep the fuel bed free and open while the fire was burning, and to permit the removal of the ash afterwards without the necessity of raking unburnt fuel out of the grate. Actually ash was collected in the pan below in a form suitable for removal without further handling.

Having elaborated this combination, it became unnecessary to rake-out the remains of an old fire. In order to light a fire, the dead cinders are cleared of ash by manipulation of the loose grid; and fresh fuel is added to fill-up the grate. The ignition burner is placed in front, with its jets playing upon the column of fuel, which soon burns. The ash collected in the pan can be removed at will. In this way, an attempt was made to minimize the objections to the use of a fuel high in ash; and after considerable experience it has been found to work fairly satisfactorily.

The writer regards it as desirable that the ash pan shall close-up the opening below the fire grate as effectively as possible, so that the fuel bed shall get its air supply at the front instead of below. It is at the front that active combustion and brightness are most desirable. If the front is adequately supplied with air, it is unnecessary to encourage combustion at the bottom of the fire.

Grade of Coke.

The grade of coke is an important matter with such a fire. Fine coke is undesirable, because an open fuel bed is best. Coarse lumps, such as just pass a 2 in. riddle, have been found excellent; and even larger pieces behave quite well when the fire is going. The grade 1 in. to 2 in. seems excellent for the purpose.

The author has given an account of his method of adapting an existing open grate so as to burn coke in a living room with a minimum of inconvenience. He is aware that others have devised arrangements which may be as good, but has had no opportunity of making a comparison. He has attempted to work after the plan described by Prof. C. V. Boys; but owing perhaps to the unsuitable conformation of the fireplace, this was not a success. Moreover, the Boys method does not seem to be a satisfactory way of dealing with the ash of coke from the modern housewife's standpoint.

Coke Ash.

The composition and character of the ash of coke is worthy of closer examination. It is not a matter of indifference. The ash may be dispersed throughout the coke, and left as a fine powder on combustion of the carbon. This is the least objectionable form of ash. Then it may also be present as lumps of carbonized shale, which is much more objectionable. Sometimes this shale on ignition leaves a calcined piece of coherent ash, sometimes a soft laminated residue which readily falls apart, and sometimes the shale is veritably explosive, flying into splinters on coming in contact with the hot fire. This is by far the most objectionable variety, especially when it is hoped to sell coke for use in open fires. There is, unfortunately, no information available, so far as the writer knows, as to what determines these properties of coal ash. A thorough examination of gas coal should include information, not only as to the kind of ash which its coke will yield, but also as to the shale associated with the coal. Of course, where shale is present in separate pieces, more might be done towards its complete elimination by such apparatus as the dry spiral separator now installed at many collieries.

Some coals do not lend themselves to the production of low ash coke; but others certainly do. Cannot more be done by co-operation with the colliery to produce coal low in ash, and then segregate it from inferior coals in the carbonizing plant, so as to produce high-grade coke for the domestic market? Practical engineers will say that this is impossible or difficult. Is it impossible? The writer thinks this is by far the most important point to consider, if consumers are to be persuaded to substitute coke for high-class household coal, and consequently if coke is to command steadily the price of such a fuel. The same trouble will make itself felt in the use of carbonized fuel, by whatever process it is prepared; and it is significant that the samples of low-temperature coke so far marketed have usually been made from selected coal low in ash. Given gas coke low in ash, the advantage which might be claimed for low-temperature coke would be materially lessened. The assumption that no satisfactory smokeless fuel will be available unless by the creation of new processes, is open to question. Good gas coke low in ash is itself an excellent fuel.

While this statement is true, it is not to be inferred that there is no need to seek improvement in coke manufacture. As is well known, there are numerous suggestions for modifying the properties of coke which may or may not prove commercially possible—carbonization of blended coals, coal briquetted with coke, and coal treated with catalytic materials. One advantage of such processes would be the production of coke yielding fine ash, which is much more easily dealt with in fires than lumps of shale. Such fuels are more compact and less spongy, a property which is important in minimizing expense of transport and storage. Sponginess is a by no means negligible shortcoming of vertical retort cokes as now produced. The point which it is desired to enforce is that good clean coke can already be consumed satisfactorily in suitable open fires; but an improved coke would naturally be still better.

The advantages of fine grinding and blending may be dearly bought if the ash is excessively light and correspondingly voluminous. One such fuel tried by the writer contained 10 p.ct. of floury ash, which was so bulky that the space provided in the fireplace was inadequate to accommodate the normal daily production. Fine grinding before carbonization will only emphasize the need for cleaner coal.

Smell from Coke Fires.

An objection commonly urged against coke fires is the liability of its sulphurous products of combustion to escape into the room. Coke burning in a shallow bed in a fireplace of normal modern type is liable to make its presence disagreeably felt; but a fire arranged as described above need never give trouble in this way. The flue gases are less diluted at the entry into the chimney flue, and consequently so hot, that the draught is unusually keen—so keen, indeed, that it becomes possible, and even desirable, to restrict the flue opening so as to keep down to a reasonable figure the ventilation produced. Thus installing such a coke fire may effect a cure where a down-draught in the chimney occurs when coal is burned, and at the same time reduce draughts in the room heated—two results often incompatible with a coal fire. Certainly, a coke fire need cause no smell.

Economy of Coke Fires.

According to the published results of Dr. Margaret Fishenden, the thermal efficiency (radiant efficiency) of a coke fire is considerably higher than that of a coal fire. The writer, though without precise data, is inclined to accept this conclusion as reasonable. Moreover, the absolute weight of fuel consumed per hour is less than when coal is burned in the same room. The combined effect of these two factors should make it possible to establish a strong claim to the economy obtainable by substituting coke for coal in the open fire. The economy of the independent coke boiler is recognized; and with the establishment of the economy of coke in the open fire, it would be reasonable for intelligent and well-informed consumers to pay a price for good coke equal to that of good coal. This is an ideal which should be sought, and seems possible of attainment.

Atmospheric Pollution.

In considering the use of coke as fuel, some misgivings may be entertained on account of its sulphur content. To-day the damage due to sulphur in fuel looms largely in the public eye; but many misconceptions are abroad. Two facts stand out as representing what is, or is not, technically possible. There is no method commercially practicable, or in prospect, for desulphurizing solid fuel—a conclusion directly following from numerous researches of fuel chemists in England, the United States, and on the Continent. When fuel is once gasified, the sulphur is converted almost entirely into H_2S, which can readily be removed from the gas in accordance with standard gas-works practice. Obviously, the extension of the use of purified gaseous fuel, such as town gas, deserves the utmost encouragement, if the damage caused by sulphur is to be abated. Incidentally, the generation of electricity from low-grade solid fuel is seen to be inevitably attended by the enhanced production of sulphur acids, owing to the large coal consumption per unit.

In view of this sulphur present, the advisability of encouraging coke consumption may be queried by those seeking to reduce atmospheric pollution. Consideration shows that this objection is unfounded. The annual British consumption of raw coal is 180,000,000 tons, bunkers and exports being excluded. Assuming an average sulphur content of 1 p.ct.—a conservative figure—this means 1,800,000 tons of sulphur, giving on combustion 5,400,000 tons of sulphuric acid. But the normal annual production of 100 p.ct. H_2SO_4 is less than 1,000,000 tons, requiring about 300,000 tons of sulphur. In 1923 this was made up as follows:

S as iron pyrites	140,000 tons
S as brimstone	66,000 ,,
S as spent oxide	70,000 ,,
	276,000 tons

These figures show that of 5,400,000 tons of sulphur available in the coal consumed, 70,000 tons only (about 1 p.ct.) recovered in gas purification was saved for use in chemical manufacture. Almost the whole goes to waste in the atmosphere, where it causes positive harm, as is well known. Developments of public gas supply would involve the automatic reduction of this insidious form of atmospheric pollution—indeed, it is the only method of fuel utilization which can make the claim to do so. One of the great merits of complete gasification methods is that they might, by gasifying the whole of the sulphur of the

coal, result in even greater reduction in atmospheric pollution by sulphur.

But there is an economic limit to the extent to which sulphur recovery can be practised. The chemical industry requires only 300,000 tons of sulphur per annum, representing less than 10 p.ct. of the sulphur available in the annual coal consumption. As one can scarcely imagine sulphur recovery being practised in excess of the needs of chemical industry, it is clear that the great bulk of the sulphur of coal will, in this country, continue to pass into the atmosphere, whether the coal is utilized direct or after carbonization, gasification, or in the generation of electricity. The consumption of coke, though yielding acid products, will always deserve encouragement, because it implies the corresponding recovery of the volatile sulphur of the coal from which it was made, and at the same time the elimination of smoke. The damage due to sulphur seems inevitably associated with the use of commercial fuels as a source of heat, light, and power.

DISCOVERING NEW USES FOR COKE.

By "EUREKA."

[Anonymous under Rule 7.]

Setting forth with the slogan of "Co-operation," how best can we find a nucleus about which to commence to co-operate and enthuse, in order to build-up the coke sales? The desirable method is obviously to discover some new and fascinating use for coke, and then, by co-operative effort from within the gas industry, to foster and encourage this new development, until it grows robust and self-sustaining. This at the outset may seem to be but a theory, and quite impracticable; but the uses of coke are so manifold that in every district there are uses lying dormant, and awaiting but the spark of enterprising co-operative effort. The truth of this statement is proved to the writer by the fact that this paper was induced by one such rare use of coke; and already this one example has grown to four, all arising within 1 mile radius and by independent persons, unknown to each other (and none of whom is the writer, or has knowledge of this paper), each with different goals in mind, but all drawing upon coke as a factor of their hoped-for success.

Now, it is fairly clear, if these four novel uses of coke be allowed to stand or fall by their own unaided efforts, the chances are against their developing to any considerable extent. If, however, these new uses be fostered by the co-operation of the gas industry, or even if they become considerably better known, the chances are with them (if they are founded on real efficiency) to augment by useful dimensions the coke sales.

Briefly stated, the four new uses under review are:

(1) PATENT INDUSTRIAL SMOKE-CONSUMING DEVICE FOR COAL-FIRED BOILERS (PATENT No. 214,789 of 1924).

This consists of amplifying the normal coal grates by additional coke grates. These coke grates serve a threefold purpose:

(1) In effect to increase the relative grate areas—a well-known factor of efficiency in steam-raising and smoke prevention.
(2) The products of incomplete combustion, coming over from the coal fire, are more completely gasified by the coke fire—again aiding efficiency and preventing smoke.
(3) The burning-up of the solid particles (carbon), and utilizing the heat in the last run or flue of the boiler—thereby enhancing fuel efficiency and smoke prevention.

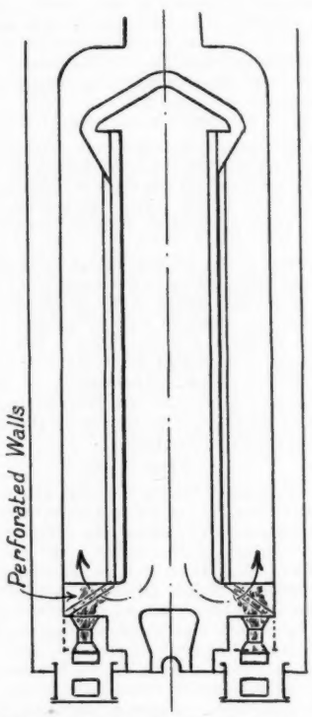
As the projected legislation on the subject of smoke prevention is likely to overcome summarily the apathy of proprietors of steam-boiler plant, it is extremely probable that the next few years will see a rapid acceleration in the use of gas-works coke for the purposes of steam raising. The instance described below of this particular application of gas-works coke has been from its inception an unqualified success, and a proved practicable solution of the problem of smoke prevention.

At the outset of commencing experiments, it was felt that any system of firing or inspectors' "Rules for Stokers" was utterly inadequate from the practical point of view to deal with the smoke question, where any proportion of coal was used for fuel, on account of the heavy demand made upon the boiler plant early in the day, and a consequent maximum consumption of fuel at this period. It was therefore decided not to interfere with the usual working of the fuel bed, but to effect secondary combustions at fixed symmetrical positions in the boiler waste-heat flues by commingling hot producer gas from auxiliary coke-fed producers, and burning same by the excess air passing away with smoky products from the coal-fired grates of the Lancashire boilers.

Small auxiliary coke-fired producers are installed at the two front corners of the boiler setting, with inclined outlets of such a size as to deliver producer gas, or the flame of producer gas, into uptakes between the bottom waste-heat return flue and the side flues to the chimney. The small furnaces are formed of inclined screen-bargrates, as giving the maximum facility for the perfect gasification of gas-works coke, with slow-moving chaingrates at the base for automatic removal of the residue ashes; the whole being surmounted by storage hoppers with capacity for one day's coke requirements. The whole arrangement is conveniently placed in a small pit below the boiler house floor level, with sufficient room opposite the chaingrate carriage to permit of its being run out on light rails for examination. A light steel-plate hood normally covers the front of this grate, and is tightly fitted for limitation of air, so that producer gas is only ignited and burning as a sheet of flame when meeting the smoke-laden products passing the burner outlets. At night-time and week-ends, when steam is not required, the auxiliary burners are completely shut-off by swing door dampers; the fireclay dampers of the by-pass flues being slightly opened to pass the fumes of the expiring coke fires away to the chimney.

Soon after setting the installation to work, surprising efficiencies, and results beyond those anticipated, followed each other quickly, and may be tabulated as follows:

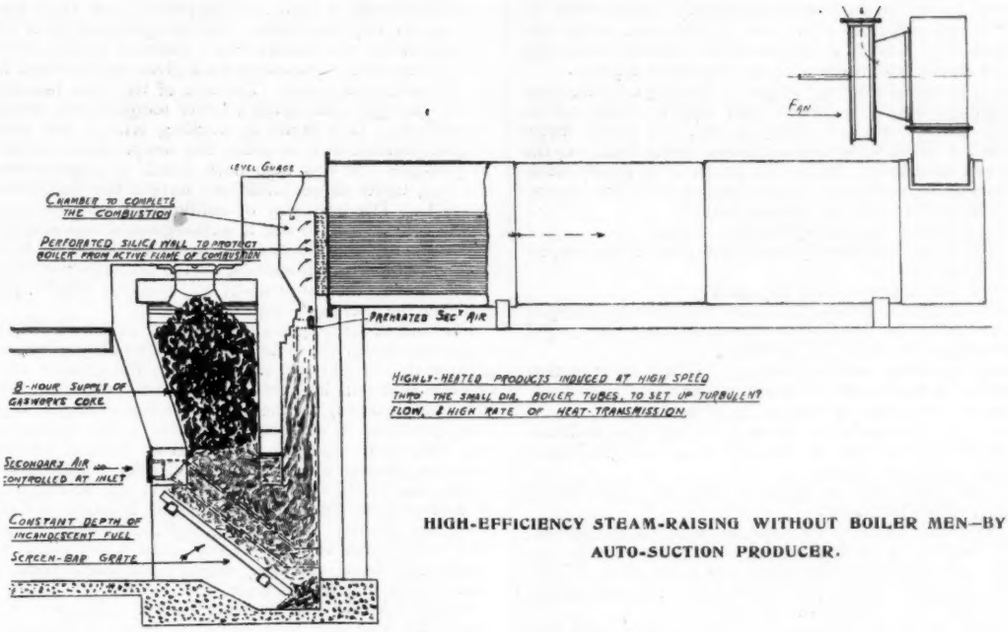
(1) The emission of black smoke from the chimney ceased; and the products escaping therefrom are now invisible, save for the first working hour of the day, when a small amount of whitish vapour is expelled.
(2) The rain-water gutters in the immediate vicinity, which before were most troublesome, and had to be scooped-out at intervals of a few months, now require no special attention.
(3) A considerable economy has been effected in the coal bill of the boiler plant, after allowing for the cost of gas-works coke for the auxiliary fires (5 cwt. of coke per boiler a day).



Plan of Boiler Flues—Showing Position of Auxiliary Producers.

(4) The working pressure of the boiler (100 lbs.) is attained in one-half the time previously required.
(5) A better circulation of water in the boiler is evidenced by the improvement as regards scaling; this being specially commended by H.M. Inspector of Boilers.
(6) The boilers are run a longer period without changing. Not only is there a conspicuous absence of the usual sooty products in the flues, but old carbonaceous deposits have been removed; and the maker's name on all fire bricks in the flue walls can be clearly discerned.
(7) No labour costs have been added as regards the staff of the boiler plant, as it is the work of a few minutes only to charge the bunkers with the day's supply of coke, and to rake-out the two bucketsful of ashes from beneath the chaingrate. In fact, the coke fires are lit by a shovelful of fire from the main coal fires; and in spite of the attention required by the coke fires once a day, and that in the first hour of the morning, the steam is up in shorter time, to the benefit of the boilerman.

The scheme has already earned the commendation of the local Sanitary and Smoke Inspectors and the Medical Officer of Health; and the promoter is looking forward to a wider adoption, as premised at the heading of this section. Thus, to gas-works situate in an industrial region, a new and not inconsiderable market would be opened, leading to an enhanced value of their coke, and consequent reduction in price of gaseous therms.


FAN
LEVEL GUAGE
CHAMBER TO COMPLETE THE COMBUSTION
PERFORATED SILICA WALL TO PROTECT BOILER FROM ACTIVE FLAME OF COMBUSTION
PREHEATED SEC'Y AIR
HIGHLY-HEATED PRODUCTS INDUCED AT HIGH SPEED INTO THE SMALL DIA. BOILER TUBES, TO SET UP TURBULENT FLOW, & HIGH RATE OF HEAT-TRANSMISSION.
8-HOUR SUPPLY OF GASWORKS COKE
SECONDARY AIR CONTROLLED AT INLET
CONSTANT DEPTH OF INCANDESCENT FUEL
SCREEN-BAR GRATE

HIGH-EFFICIENCY STEAM-RAISING WITHOUT BOILER MEN—BY AUTO-SUCTION PRODUCER.

(2) BRICK KILN COAL ECONOMIZER AND SMOKE PREVENTER—GAS-WORKS COKE IN THE CHAMBER OF THE KILN (Patent No. 142,237 of 1920).

It is generally recognized that the relation of the brick manufacturer to the gas engineer is that of a potential seller of his goods, while the former can offer no *quid pro quo* by becoming a purchaser of gas-works products. It is only to the deeply meditative gas engineer that this lack of reciprocity in business relations strikes an inharmonious note, and makes him cast about for a basis of co-operation. The following recent improvement in the method of firing kilns used in brick manufacture provides such a basis of co-operation; and, while still a novelty to brickworks in general, it has long since passed the experimental stage in the large and efficient works where it was introduced. While the brick manufacturers of this country rank among the larger users of cheap coal, this fact is not publicly apparent, inasmuch as the fireclay and coal seams often lie in contiguous situations, and are mined with the minimum of effort. The coke salesman is therefore faced with a severe financial disability in seeking to rival this cheap and effective fuel, unless he can exploit the varied properties, and greater utilities, of his special product, gas-works coke.

In brief description, it is well known, in continuous kiln working, that the connecting flues between adjacent chambers (for instance, the latest-fired chamber, and the one about to be fired) are sealed against heating gases passing forward by a shield or screen of laths covered with paper, until the moment decided to " start-up " this latter chamber, when the screen is ignited by burning waste, &c., dropped from the usual firing holes in the top of the kiln. In the special arrangement now being described, the communicating or connecting passages are formed into pockets holding a stack of gas-works coke, and sealed by paper in the usual manner. On igniting this paper, as before indicated, the hot gases pass forward into the adjacent chamber; the coke fulfilling three special functions:

(*a*) The screen of cold coke filters the products of combustion passing forward, and thus obviates any loss in a proportion of the newly-made bricks by discolouration and consequent depreciation of value.

(*b*) The considerable quantity of moisture held in suspension by these hot coal gases is also prevented, by the coke screen, from having an adverse effect, and retarding the drying processes.

(*c*) As the temperature rises, and the coke subsequently becomes ignited, such above-mentioned gases and vapours are converted into combustible gases, and a considerable augmentation of heat occurs, just at the time it is required, producing refractory goods of a sounder, better burned, and cleaner nature than hitherto possible with the same fuel economy.

In other words, the trade of brickmaking says with one voice, " Coke cannot be used for brick burning; its flame is too short and intense. We must use coal for its long flame, to heat our big kilns all over and burn more uniformly." Here we have a brickmaker, with a two-step process, getting advantage from gas-works coke. The writer believes brickmakers purchase coal at less than 20s. a ton, while gas-works want relatively 30s. a ton for coke; and this is the real reason for burning raw coal for brick kilns. However, it will be obvious to furnace designers or carbonizers that such an efficient combustion of coke, as opposed to the ancient all-coal, direct-fired system, will, if generally adopted, result in an enormous saving of fuel and a reduction of the black columns of smoke which now pour from the majority of brickworks, and will be of great mutual benefit to the gas-works and brick-works of this country.

(3) NEW USE OF COKE BREEZE IN BRICKMAKING (Patent No. 234,538 of 1925).

Coke breeze, the minute but multitudinous offspring of the parent coke, has hitherto been regarded as the least useful member of the coke family. Generally regarded as a drug on the market, and only fit for boiler firing with special pressure grates, and for purposes of particular concrete blocks, it has not commanded much monetary return. The growing use for town gas for industrial furnace work has induced a demand for non-conducting bricks to conserve heat and economize fuel. So far the demand has been chiefly met by porous bricks manufactured from imported infusorial earths. If a porous insulating brick can be made from native materials, national economy must ensue.

This desirable object is well achieved by a new process of manufacture. The method consists of blending gas-works coke dust or fine breeze with silicious clay, and burning at high temperature. In manufacture the coke is consumed; as, while assisting the kilning, it forms the desired locked cells or microscopic pores. In use the resulting bricks, while being quite equal to bricks made from imported clays, are actually stronger and more robust—a feature of merit, as it widens the field of practical application.

(4) BOILER FIRING BY SUCTION PRODUCER.

Some years since, a local manufacturer, believing he had discovered " surface combustion," built himself a mass of chequer brickwork immediately in front of his boiler. He burned his fuel external to the chequer work; and the products of combustion were utterly consumed on the surfaces of the chequer brickwork—the products only entering the boiler flues. Time, however, has eclipsed the experiment; but the pioneer still believes he was on the right lines.

The coming of waste-heat boilers, whereby hot products are propelled at high speed, under the influence of a fan, through the relatively small and long tubes, has set-up such a standard of boiler efficiency, 90 p.ct. and over, that it is more than probable the above pioneer was much more right than wrong. As an example, with waste-heat boilers it has been definitely proved by irrefutable test " that the steam evaporated per pound of fuel burnt is almost the same as that which can be obtained by firing breeze and small coke straight into a Lancashire boiler, in spite of the fact that these waste-heat boilers were only supplied with the products of combustion after their temperature had been reduced to under 700° C." That is to say, the retort settings had been heated for nothing, or no fuel costs.

The present-day boiler plants for steam raising in mills are nearly always isolated or one-boiler plants Each boiler therefore, having little or no machine stoking appliances, absorbs the services of a boilerman continuously. Furthermore, coal for boiler use can be purchased at some 19s. a ton, as compared with 25s. to 30s. a ton for gas-works coke; so that there is little inducement to burn coke in the average installa-

tion of small boiler plant, where machinery cannot well be applied. Consequently, the economies of the case entail the constant service of a man to produce that which we do not want—viz., a smoky atmosphere in our industrial centres.

Some gas engineers have high hopes of town gas being used for boiler firing; but it is feared that this is ruled out as economically impracticable for many a day. It would therefore seem that a combination of a tubular boiler built on the lines of a waste-heat boiler and a coke producer to gasify coke, by only requiring the services of a man (say) once in four hours, would serve the public weal in several ways:

(1) Prevent pollution of atmosphere by smoke.
(2) Raise steam more efficiently in the many small and single-boiler installations.
(3) Conserve our national coal deposits.
(4) Find a market for gas-works coke, and thereby cheapen gas production for the improvement of amenities in gas usage within the home and industries.

The drawing is almost self-explanatory. It will be seen that the arrangement is automatic or nearly so, as:

(1) The fan is controlled by the steam pressure.
(2) This acts directly on the air induced through the producer.
(3) The producer need only be charged once in eight hours' working—once per diem.
(4) The ashes need only be removed once in eight hours' working—once per diem.
(5) The screen-bar grate overcomes all need of clinkering, as its function is to prevent agglomeration of coke, so that it continuously creeps-down the grate as it is consumed; its ashes being precipitated into the ashpan before fluxing into clinker can occur.

It would seem that with this arrangement of high-speed turbulent flow of products through relatively small tubes, whereby maximum heat transmission to the water is assured, over 90 p.ct. of tube efficiency could be obtained, and (say) 85 p.ct. producer efficiency—making an over-all high fuel efficiency of 76 p.ct. To this must be added the efficiency in use, or commercial efficiency, which, after all, is the most important; and by the general use of the arrangement the boon of smoke prevention would be allied to coal conservation, and greater monetary efficiency in steam raising for our industries.

UTILIZATION AND SALE OF COKE.

By "NON MULTUM SED UTILE."

[S. QVARFORT, Warta Gas-Works, Stockholm.]

The following is a summary of the utilization of the different sizes of coke:

	Most Suitable Size.
Ranges	15 to 25 mm.
Heating stoves	15 to 25 and 25 to 40 mm., according to size of stove.
Open fireplaces with grates	15 to 25 mm.
Tile stoves	15 to 25 and 25 to 40 mm.
Blast furnaces	50 to 100 mm.
Foundries	> 60 mm.
Producers	From 6 mm. and upwards, according to construction.
Steam boilers	From 10 mm. and upwards, according to construction.
Forges	15 to 25 mm.
Bakeries	15 to 25 and 25 to 40 mm.
Central heating boilers	From 25 mm. and upwards —*i.e.*, larger coke for boilers with upper combustion than for those with under combustion.

A central heating boiler of special Swedish construction gives excellent results even with a size of 15 to 25 mm.

It is important that gas-works should sell their coke graded in many different sizes. In one special case a gas-works find it necessary to offer the consumers the following sizes: 15 to 25, 25 to 40, 40 to 60, 60 to 85, and 85 mm. Only by an extensive grading can the demands of customers be satisfactorily met.

From the customers' point of view:

1. The coke should be strong enough to withstand rough handling in transport.
2. The coke ought to be well screened. Economy of fireplaces is dependent on the size of the fuel.
3. The ash content ought to be low.
4. The moisture ought to be low.

Heating stoves and open fireplaces should be supplied with coke having a relatively low sulphur content. The former requires coke with ash of a high melting-point, to prevent formation of clinker.

For coke used in central heating boilers the chief requirement is correct size. This varies with the type and size of the boiler, and with the height of the fuel bed. Some boilers need coke larger than 85 mm., others coke of 15 to 25 mm. For the same type of boiler, but for different sizes, up to four sizes of coke may be used. The larger the boiler, the larger should be the coke. As a rule, the boiler ought to be filled; but if too small coke is used, bad losses can be avoided by incomplete filling. The melting-point of the ash is also of great importance. In some boilers it is very difficult to remove the clinker, and for this reason a high melting-point (more than 1400° C.) of the ash is very desirable. The temperature in a coke fire is dependent on two factors—viz., the load on the boiler and the size of the coke. Increased load gives an increased fire temperature, and *vice versa*. The size of the coke has the opposite effect. Larger coke gives a lower temperature, smaller coke a higher one. If a boiler is working with a low load and the largest possible size of coke, the temperature becomes as low as possible. It has also been found in practice that boilers working under these conditions have a fire temperature below 1400° C. The best way of obtaining a suitable melting-point of the coke ash is to use a well-regulated mixture of coals, of which the melting-points of the ashes are known. It is attended with a number of difficulties, and is less effective, to add afterwards some other substance, for instance kaolin, in order to increase the melting-point of the ash.

For central heating boilers, as well as for all fireplaces with magazine firing, the coke should be as heavy as possible. The greater the weight per unit volume, the greater the quantity of coke that can be taken by the fuel magazine. This is of great importance, as the time between changes is prolonged. Coke produced in chamber ovens has in this respect an advantage over that made in horizontal or vertical retorts. Apart from the greater tensile strength of coke produced in chamber ovens, this is its only advantage over the so-called gas coke. It is often asserted that the losses on account of carbon monoxide are greater when using light coke—for instance, that from continuous vertical retorts—than when using heavy and dense coke from chamber ovens. Extensive tests, however, have shown that this is wrong.

Should coke be sold by weight or by volume? For a long time coke was sold by volume, at least to small customers; and this may have been right, before the gas-works and coke-oven-plants had grown to the great industries of to-day. But is it still right to sell coke by volume to small customers? Seen from the standpoint of the producers of coke, the sale by weight is no doubt the simplest and cheapest way. But how does the consumer look on the matter? His view of the matter is this. If the coke is wet, he must buy the water at the same price as the coke, if this is sold by weight, and this risk could be avoided by buying the coke by volume. This is true, but the risk that the coke has a high content of water is very small, at least when buying direct from the producer, as there is a strong tendency both at coke-oven-plants and gas-works to get the coke as dry as possible—*i.e.*, not holding more than 5 p.ct. water.

The actual weight, however, of one hectolitre of coke may vary considerably, depending on whether it is heavy or light. A heavy coke may weigh 45 kg. or more per hectolitre for a medium size, and light coke 32 kg.—a variation of about 30 p.ct. As chamber oven coke as a rule does not hold more than a maximum of 15 p.ct. of water, it is evident that this difference in weight between heavy and light coke is of much greater importance. In favour of the sale per volume, it is often emphasized that the deliveries may easily be controlled by the customer by measuring a certain space in his cellar, and seeing if this is filled up by the coke delivered. Even this may fail, because tests have shown that the following sizes give the following deficiencies in volume when emptying coke hectolitre by hectolitre into a measure holding 480 hl.:

Coke, > 80 mm.	13·0 to 14·6 p.ct.
,, 45 to 80 ,,	11·4 to 12·4 p.ct.
,, 25 to 45 ,,	7·6 p.ct.

The first figure in the above refers to careful emptying, and the second to shooting. If the coke, however, is sold by weight, and then usually in sealed sacks, the customer may weigh some of the sacks on a decimal balance, and then place them to dry for a week on a hot flue and then weigh them once more. He then gets to know both the moisture content and the weight of one hectolitre of dry sample, and is thus able to control the delivery. A method which has now been practised at a gas-works for many years, to the satisfaction of the customers, is to sell the coke on the basis of a determined weight of 45 kg. per sack for the sizes > 85, 60 to 85, 40 to 60 mm., with the addition of 1 kg. for eventual moisture; and on the basis of 50 kg. per sack for the sizes 25 to 40 and 15 to 25 mm., with the addition of 2 kg. for moisture.

In many cases one has choice of several fuels for a fireplace. The deciding factor is cost—not only the price of the intended fuel per kilogram and per calorie, but the cost of the useful heat obtained from the fuel by firing. We thus get three factors: The price of the fuel per kilogram, the net calorific value per kilogram, and the efficiency of the fireplace. The matter is consequently complicated. In addition to this a certain fuel may have advantages on account of smokeless combustion.

The figures of efficiency stated in the table are based upon careful tests, especially with central heating boilers, which the author has performed himself, or of which he has a direct knowledge. A normal load is presumed in all fireplaces and plants. The relative cost for the utilization of coke is made 100.

The table is made up on such a basis that the cost of coke for every fireplace is 100 price units per kg. If wood should be as cheap as coke when used, for instance, in a central heat-

Comparative Figures of the Real Costs for the Utilization of Different Fuels.

Fireplace or Plant.	Coke.		Coal.		Anthracite.		Wood.		Charcoal.		Fuel Oils.		Gas.		Electricity.	
	Efficiency. P.Ct.	Relative Price per Unit.	Efficiency. P.Ct.	Relative Price per Unit.	Efficiency. P Ct.	Relative Price per Unit.	Efficiency. P.Ct.	Relative Price per Unit.	Efficiency. P.Ct.	Relative Price per Unit.	Efficiency. P.Ct.	Relative Price per Unit.	Efficiency. P.Ct.	Relative Price per Unit.	Efficiency. P.Ct.	Relative Price per Unit.
Ordinary range, gas cooker, or electrical cooker respectively	about 10	100	about 10*	109	about 10*	115	about 8	39	about 10*	103	..	..	60	353	55	70
Ordinary heating stove, gas stove, or electrical stove	82	100	..	..	85	109	about 70*	41	85*	107	..	..	85	61	100	16
Open fireplace with grate	20†	100	15†	82	15*	86	10*	24	20*	103	..	..	..	..	..	..
Tile stove with grate	78	100	..	..	..	..	80	50	..	..	..	..	..	..	..	..
Central heating boiler and ditto for oil firing	80	100	..	..	70	100	60	37	..	..	80	147	..	..	..	..
Bakeries	15*	100	10	73	..	..	10	32	..	..	..	..	30	118	..	..
Forges	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Foundries	40	100	..	..	..	..	..	..	30*	77	..	..	..	..	..	..
Blast furnaces	80*	100	..	..	..	..	..	..	80*	103	..	..	..	..	..	..
Producers	73	100	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Boilers with chain-grate stokers	66	100	73	124	(60)	(104)	..	..	..	..	..	..	..	..	98	19

ing boiler, it must thus cost only 50 price units per kg. With gas the price unit is reckoned per cub.metre, and with electricity per KW.-H. In comparison with coke, gas may cost 353 price units per cub.metre when used in ranges, electricity only 70 price units.

Figures of efficiency marked with an asterisk are assumed figures, which are based on a certain degree of probability. Other figures of efficiency have been obtained by tests, with which the author is well acquainted. Figures marked with dagger are from English literature.

Regarding cooking ranges, gas is cheaper than coke, if the price of the gas is moderate. Electricity will only be able to compete with coke in exceptional cases. In heating stoves, coke is no doubt the cheapest fuel. The same thing applies to coke used in open fireplaces. It is also most advantageous for use in tile stoves.

For the central heating boiler, which is specially constructed for coke, this fuel is, of course, cheapest. Only in exceptional cases are fuel-oils able to compete. For bakeries coke is probably cheapest, and for forges will be able to compete with coal. In foundries there will scarcely be used any other fuel than coke. Boilers heated by coke breeze on chain-grate stokers give a relatively high efficiency and are well able to compete with other fuels.

POPULARIZING THE DOMESTIC OPEN COKE GRATE.

By "OPEN SESAMÉ."

[HERBERT JOHN TOOGOOD, Elland, Yorks.]

The inefficiency of the open domestic grate in the consumption of coal, for warming the home, is appalling—especially considering the vast opportunities that have existed throughout the ages for its improvement. Its efficiency averages as low as 12 p.ct.; and even modern open coal fires only muster a 20 p.ct. efficiency. This inefficiency means burning to destruction (with all the attendant dirt, smoke, soot, and labour) 88 lbs. of raw coal to secure the heat of only 12 lbs. of coal in the room. Nationally and broadly, the household coal fires of Britain, in utilizing the heat of 8,000,000 tons of coal to warm the homes, fritter away in waste some 32,000,000 tons of raw coal annually, with all the valuable secondary products.

As a comparison with our national policy, let us consider Denmark—a country having no natural endowment of fuel of any sort. Here all fuel is imported; therefore it will be obvious that fuels will be used more in accord with their true intrinsic worths. Consequently, coal and gas-works coke are imported, largely from our east coast ports. The coal is carbonized in gas-works; there are no coal fires in Denmark. The homes are almost universally heated by coke stoves, the cooking is done by gas, and Denmark is world-renowned for the cleanliness of its cities, the purity of its atmosphere, and the health and amiability of its fair and blue-eyed citizens.

COMPARISON BETWEEN COKE AND COAL IN OPEN GRATES.

In domestic grates, coke burns similarly to coal, except with this detail difference: Gas-works coke having already passed through a 900° C. stage in the process of gas manufacture, no gas will be liberated from the coke surface until the surface of the coke pieces composing the fire again attain approximately the temperature of manufacture (900° C.). Hence (relatively to coal) the difficulty of kindling and maintaining the small handful of coke usually contained in the domestic grate. Moreover, the gas, when released from the coke, does not burn with a luminous flame, but burns invisibly at the surface pores of the coke structure, and apparent only as a surface glow. It is common knowledge that gas-works coke, when burned in closed stoves or in bulk producers, is the finest, cleanest, and healthiest native fuel in Britain, and is the cheapest of all fuels.

The non-use of coke as the staple fuel in British households is due to insistence on open-grates, and to the lack even to-day of a popular household open grate, to consume properly, and to the satisfaction of the public, these small parcels of gas-works coke. There is nothing wrong with the coke; it is the grate, or want of it—as can be realized by inspecting your local gas-works retort bench, comprising thousands of tons of brickwork, heated and maintained heated at 1400° C., or a temperature far above that of molten metal, over this mass of brickwork, by the efficient use of coke alone.

There are already on the market several open coke grates. Exhibitions and showrooms show beautiful open coke fires; but it is feared the fires are lit before the visitors arrive, and are fed surreptitiously with coke at all too frequent intervals, so that complete information for the visitor is not so self-evident as to be readily assimilated. As a consequence of this, the public fancy for coke has not yet been caught to the degree of rendering coke popular in the home.

COMPARATIVE COSTS OF FUELS.

To generalize, it may be taken that normally for cheerfully and comfortably heating a room:

(1) A coal fire will cost in fuel ¾d. per hour = 9d. for 12 hours.

(2) A coke fire will cost in fuel ½d. per hour = 6d. for 12 hours.

(3) A gas fire will cost in fuel 1½d. per hour = 1s. 6d. for 12 hours.

(4) An electric radiator will cost in fuel 5d. per hour = 5s. for 12 hours.

To abate the smoke nuisance and to conserve coal, demand that Nos. 1 and 4 (which depend on the destruction of raw coal, and production of smoke) should not be considered until the claims of Nos. 2 and 3 have been fully examined. Nos. 2 and 3 are most efficient, conserve coal, both in manufacture and in use, and produce no smoke. Rather is the smoke during manufacture converted to those valuable bye-products of carbonization, tar, tar derivatives, and ammonia, which are so necessary to our complex industrial requirements in time of peace, and are absolute essentials to our national existence in time of war. Therefore, the ideal fuels, both nationally and individually considered, are:

(1) Gas-works coke "to keep the home fires burning," to maintain a constant hot water supply, and to give a cheerful radiant heat at least in one room.

(2) Gas for intermittent heating, such as cooking, bedroom and occasional room heating, ironing, and lighting.

In the face of the superior economy of coke over coal, what are the factors in the minds of probable users which cause their orders to go to the coal merchant at 40s. to 45s. a ton of coal, instead of to the gas-works for coke at 25s. to 30s. per ton? In summary form they appear to be:

(1) Coke is irresponsive to the poker, much to the regret of the housekeeper.

(2) Coke in the morning shows considerably more ash to be cleared away.

(3) Coke fires, if left, burn pessimistically dully.

(4) Coke requires more constant replenishment, to keep a uniform fire.

(5) Coke fires, in small sizes, tend to go out of their own accord.

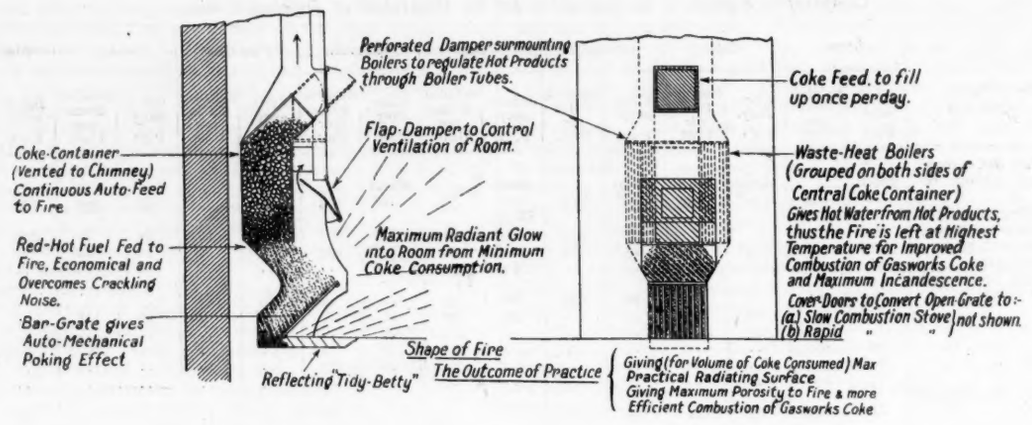
(6) Coke is more difficult to ignite.

(7) Coke takes longer to kindle to a glowing fire.

(8) Coke burns with a crackling sound.

(9) Coke when burning spurts bits on to the hearth, rendering the hearth untidy.

These charges may be exaggerated, and may not all be cor-


Perforated Damper surmounting Boilers to regulate Hot Products through Boiler Tubes.
Flap-Damper to Control Ventilation of Room.
Coke-Container (Vented to Chimney) Continuous Auto-Feed to Fire
Red-Hot Fuel Fed to Fire, Economical and Overcomes Crackling Noise.
Bar-Grate gives Auto-Mechanical Poking Effect
Maximum Radiant Glow into Room from Minimum Coke Consumption.
Reflecting "Tidy-Betty"
Shape of Fire
The Outcome of Practice
Giving (for Volume of Coke Consumed) Max Practical Radiating Surface
Giving Maximum Porosity to Fire & more Efficient Combustion of Gasworks Coke
Coke Feed, to fill up once per day.
Waste-Heat Boilers (Grouped on both sides of Central Coke Container)
Gives Hot Water from Hot Products, thus the Fire is left at Highest Temperature for Improved Combustion of Gasworks Coke and Maximum Incandescence.
Cover-Doors to Convert Open Grate to:-
(a) Slow Combustion Stove
(b) Rapid
not shown.

rect; but that sufficient objection exists to warrant costly experiments to be undertaken to provide an alternative fuel to gas-works coke, is well known.

SMOKELESS FUEL—*i.e.*, LOW-TEMPERATURE COKE.

To obviate the above difficulties, costly installations have been erected over the long period of twenty years, to produce, if possible, economically a low-temperature coke which, while retaining the smokeless attributes of gas-works coke, will be more free burning and more readily ignited. Unless such a fuel can be produced intrinsically as cheap as gas-works coke, there would seem to be no national need for it, nor any need by the housekeeper (the Chancellor of the Exchequer on household fuel). If such low-temperature fuel be intrinsically dearer than coke, then it would be better to burn gas in gas-fires to heat the home, and thereby obviate the household work of carrying the fuel, feeding the fire, and cleaning the grate of ash accumulation.

NEW DEPARTURE IN OPEN DOMESTIC GRATES.

Having surveyed the characteristic features of both coal and coke when burned in present-day types of open domestic coal grates, attention is directed to the above diagrammatic illustration of a new departure in open domestic grates, the design of which is the outcome of the trend of thought which forms the subject of this paper. The object of this new departure is to furnish the needful grate, having the necessary characteristic features, to suit in the best manner possible ordinary gas coke, in order to render this universally cheap and efficient fuel more serviceable and thereby popular in the home. In other words, instead of spending money perpetually to modify the coke formation (low-temperature coke) to suit the difficulty of burning coke in existing open coal grates, the suggestion is to make an open household grate that will properly and satisfactorily burn this universal and cheap native fuel.

Let us take each salient phase separately in paragraph form, for the sake of clarity:

(1) RADIANT HEAT.

Radiant heat being the acknowledged desideratum for hygienic house warming, and the efficiency of radiation being a function of the temperature, a bright incandescent glow is necessary to household efficiency and satisfaction in use. This extra brightness must not be achieved by a keen draught, or fuel will be wasted, but is accomplished by nesting the body of the fire in solid non-conducting firebrick, except for the one open front which radiates both light and heat rays into the room. Thus the temperature of the fire is conserved, as no heat leaves the small handful of coke by stealth or conduction. Hence, for the quantity of fuel burned, the fire is brightest and of the most cheerful aspect.

(2) WHERE THE AIR ENTERS.

Where the air first enters the interstices between the cobs of coke localizes the plane of brightest incandescence. Hence, following the above reasoning, the air should enter the coke face which is directed towards the room to be heated. By comparison, in present-day grates, the air enters vertically upwards under the firebars, thus the brightest incandescence of the coke remains unseen, and the maximum degree of radiant heat expends itself downwards and wastefully into the ashpit. To amalgamate the above desiderata, the new grate has no bottom bars or bottom to the fire, but the erstwhile front and floor are merged together, to form the inclined screen bars, facing the room to be heated. The inclination of the grate brings a mechanical advantage, inasmuch as the coke, as it is consumed, slips and creeps down the grate, and just gives that needful amount of attention quite automatically to prevent the formation of cavities in the coke.

(3) THE ASH.

The ash contained in all coals in varying percentages shows to greater disadvantage in the combustion of coke, because the contained ash clings to the incandescent surface, and masks the cell structure of the coke. The new grate attempts to overcome this, as far as is practicable, by causing the coke to slip down the inclined screen bars as it burns away, and thereby automatically shake free the film of dust from the bright glowing surfaces of the most active combustion—namely, that surface exposed to the room.

(4) THE TOP OF THE FIRE.

The upper surface, or top of the fire lying at the angle of repose for coke should likewise maintain a bright red heat at all times, in order to radiate a constant source of heat into the room. This obviously entails frequent replenishment of fuel, in order that no cold coke shall ever be in evidence to check radiation of heat. With the new grate this is accomplished automatically by the coke container surmounting the fire in which the coke is pre-heated by the products of combustion as they enter the chimney. The coke thus heated to red heat gravitates gradually into the fire, to take the place exactly of the coke that is consumed.

(5) THE CRACKLING NOISE.

The crackling noise of burning coke, and accompanying spurting of minute ash particles on to the hearth—so objectionable and irritating to the home circle—is overcome, or reduced to negligible proportion, by the thorough drying and pre-heating of the coke in the coke container arranged within the chimney. It will be observed that the coke, before entering the fire proper, is slowly brought to a red heat, so that a quiet glowing cap to the fire is always in evidence.

(6) CONSTANCY OF VOLUME OF FIRE.

The constancy of volume of fire is assured at all times by the coke container. With present-day fires, the heat is too fierce, the fire is too big, or the fire is burning low and sullenly dull—all of which take from the comfort and enjoyment within the home. The new grate, throughout the livelong day, maintains an even glow of warmth, and therefore inspires content and peace of mind.

(7) WARMING ALONG THE FLOOR.

The warming along the floor of a room is essential to real comfort, as once the lower portions of the room are radiantly warmed the upper portions will naturally receive their full quantum of heat. Accordingly, the inclined firebars will direct the rays of heat across the floor of the room; but in doing so it is inevitable that a percentage will radiate on to the hearth. The hearth is therefore fitted with an adaptation of the old-fashioned "tidy-betty," which hides the ash, and with its polished facets reflects the downward rays of heat back into the room.

(8) CONTINUOUS SUPPLY OF HOT WATER.

A continuous supply of hot water is no longer a luxury, but is a necessity in the home. If, however (as has hitherto been done), the boiler is placed round the coke fire, the high temperature is stolen or conducted from the incandescent coke, to the serious disadvantage of crisp coke combustion; and a deterioration in the cheerful appearance of the fire will result. Consequently, with the new fire, a much larger and high-efficiency tubular boiler is grouped in the chimney, to regenerate the heat from the products of combustion, and to utilize the heat rays which emanate from the top of the fire, and which otherwise would be lost in the darkness of the chimney.

(9) DRAUGHT CONTROL.

Draught control is furnished by means of a damper in the chimney, because, contrary to popular opinion, coke for combined economic and bright burning requires the minimum of controlled draught. It will be observed, also, that the boiler tubes can readily be cleaned, and that the coke container evacuates any products at a point above the damper into the

chimney, so that by no possibility of circumstances can the products of combustion enter the room.

(10) IGNITION OF COKE.

Ignition of coke is always more difficult than of coal, though any form of fire-lighter or gas poker will suffice, especially if the cinders of the previous day be used. It is proposed to incorporate a fixed fire-lighting gas poker with this new grate.

(11) KEEP THE HOME FIRES BURNING.

In engineering history difficulties are more often circumvented than overcome. Similarly, in this new open grate for coke, it is proposed to circumvent the difficulty of kindling the coke fire, by taking away the need for it. To accomplish this :

(1) The coke container (out of sight) will store 12 to 24 hours' fuel requirements.

(2) The grate will be fitted with a plate or door, so that at night-time the door is closed, converting the fire to a slow-combustion closed stove, to lie virtually dormant till morning.

Thereby the following advantages ensue :

(*a*) Difficulties of lighting fires overcome.

(*b*) Hot water ready in early morning.

(*c*) Firebrick grate will be hot, so that, should combustion have ceased, the fire will be most readily kindled.

(*d*) Coke consumed during the night will not have been wasted, as the room will to an extent have been kept warm, fully ventilated, and ready for the morning.

(*e*) The door can be so fitted with air inlets that it can (in conjunction with the damper) convert the new grate to a rapid-combustion stove, to urge hot water if, and when, required.

(12) EFFICIENCY OF FUEL CONSUMPTION.

Efficiency of fuel consumption depends to a large extent on the proportion of the glowing coke exposed for radiating its heat—that is, the greater the surface for a given volume of coke, the greater the efficiency. To accomplish this desired end, the back of the fire follows the contour of the fuel face, so that, for the volume, the depth of coke back to front is small, thereby ensuring the highest practical radiating efficiency.

(13) REDUCTION OF ASH.

Reducing ash in coke by washing the original coal has been practised for many years. This is all to the good, up to a point; but beyond that point it is not economical to go. This precise point is elusive to define; but it is that the intrinsic cost of gas-works coke to the housekeeper must not be thereby increased. Cheapness of fuel is the strong point of gas-works coke, and is essential to success. Assuming that the new grate will overcome the deleterious effect of a normal ash content in the coke, then, seeing that the domestic grate must receive its morning clean-up and coke replenishment, it is just as easy to sweep-up and remove a shovelful of ash as to dust-up and remove a spoonful of ash—particularly so as the ash from ground and washed slacks, being almost as fine as snuff, stains and defiles a hundredfold as compared with ash from coke prepared from natural coal.

(14) IMPROVEMENTS EMBODIED.

The improvements in industrial furnace work which have so advantageously developed in recent years may be seen embodied for domestic benefit in this new open household grate. For example :

The inclined bar grate.

The continuous feed.

The waste-heat boiler.

The level-gauge damper control.

The fire controlled at the back, giving option of doors and primary air control.

CONCLUSION.

In conclusion, the proposed new domestic grate is, in a phrase, primarily designed as an open coke grate which can be worked closed, as compared with present-day domestic grates, which are primarily designed as closed coke grates which can be worked open—a differentiation of extreme importance in the popularizing of gas-works coke for domestic use in the region of its production.

If this trend of constructive thought enables the popularity of coke to be visualized, it will be seen that such a grate is truly the " Open Sesamé " to the solution of many national problems —viz. :

(1) Conservation of national coal deposits.

(2) Prevention of smoke pollution of the atmosphere.

(3) Increase in products of carbonization, so necessary for our prosperity in peace, and essential for our preservation in time of war.

(4) Hygienic heating of the homes of the people.

(5) Provision of universally cheaper gas for heating, power, and lighting.

SALE AND UTILIZATION OF COKE.

By " OPTIMIST."

[P. E. KNIGHT, 14, Pier Road, Erith.]

How does coke stand when ranged beside electricity, anthracite, oil, gas, and coal? Electricity is out of the question as regards price. Anthracite is very dear, being £6 per ton, and needs a special and expensive stove for its combustion. Oil is too messy and ineffective as a radiant heat producer. Gas is coming into favour, but at the moment is too dear for universal use for household warming. Coal, therefore, is still the serious rival; and at 40s. a ton is not a high-grade quality, usually containing a lot of incombustible slate. Small and clean coke can be bought at 38s. per ton, but in bulk is much more than coal. The chief advantage of coke lies in its porous structure, air being able to enter freely into it, and so quick combustion is obtained and the mass soon reaches incandescence. The products are practically smokeless.

It is a standing disgrace to our modern civilization that in face of all the known facts regarding the evils of coal stoves builders everywhere are being freely permitted to instal these death-dealing, fog-making appliances—and all for the sake of a few paltry shillings! The owner of a new house costing £1000, with a modern (?) coal range cannot be assured that he will get hot water for his bath. It is always a question whether he is to be the lucky one. What a disappointment it is in a case like this to find that hot water can only be obtained by heaping scuttlefuls of coal on the fire every time a bath is required, whereas, if a stove such as the " Sentry " or the " Glow-worm " had been installed in the first place, hot water is positively assured in abundance for baths, sinks, &c., and if necessary for a small radiator system as well. These stoves burning small coke can be run night and day for 3s. 6d. per week, giving hot water, modified cooking, and a cheerful warm fire under complete control, without all the labour of cleaning, and the dirt, smoke, and dust always associated with coal ranges.

I suggest that the Secretary of the British Commercial Gas Association should convene a meeting of all its members to discuss the proposition of launching a national scheme for the adoption of coke as a universal solid fuel. The Daily Press should be particularly invited and cordially treated, and enthusiastic prominent men asked to address the meeting on the subject. Only those who are capable of a strong lucid speech on the merits of coke should be allowed to speak, and a resolution should be passed forming a working committee to act in conjunction with the " B.C.G.A." It would be imperative to ensure that a generous and favourable report gets in the Daily Press, which should be followed up with written articles and advertisements of a striking character, showing the good points in no uncertain terms.

The committee should then co-opt members of all societies interested in smoke abatement, air pollution, &c., and form a national board. Lecturers should be trained with the sole aim of educating the children; and to this end permission to visit schools to lecture on the subject should be obtained, and the children entertained to a bright and interesting discourse on the abuse of coal and the advantages of coke. To stimulate further interest, prizes should be offered for essays on the subject, and a scheme of distribution could be arranged similar to that adopted by the Society for the Prevention of Cruelty to Animals. This would bring the subject into great prominence, and the rising generation would be prepared to appreciate the advantages of using coke.

The principal cinemas should be supplied with an interesting film on coke making, and a permanent advertisement should be put on the screen showing London in a fog, and as it would be in the smokeless days. Each M.P. should be invited to visit the gas-works in his constituency, and should be impressed with the importance of carbonizing all coal, and the advantages of coke. Architects, sanitary inspectors, &c., should be similarly treated.

Attractive leaflets should be supplied to all gas companies, to be sent out with accounts and receipts, which could be supplemented with attractive posters depicting the " Yellow Peril of Fog."

Research should be made to devise a suitable grate and furnace for use with coke, and samples should be on view and in use in all gas undertaking showrooms. Information should be circularized among the builders, architects, ironmongers, &c., and these people encouraged to stock and push these types only. If the propaganda were astutely handled, the scheme would become one of gradual evolution, and works would be able to make provision for the increasng demand as it became felt.

It should be the ultimate aim of the organization to get a Bill through Parliament, prohibiting the use of raw coal in any open grate or furnace.

The handling of coke to the consumer could be done through the present coal merchant, whose stock would be coke, instead of coal, and who would then be able to dispense with a large

part of his railway rolling stock, as he would draw his supplies from the local gas-works.

In outlining the rosy prospects for the future of coke, one must needs think of the present, and what can be done to turn the huge stocks on hand into £ s. d. Unfortunately the gas engineer is to blame for the present position, for in most cases he has thought more of his " make per ton " than the quality of his coke, which bye-product has been regarded as a necessary nuisance.

Advertise on a generous scale, and commence at once to create the market that is waiting; get the propaganda going as quickly as possible, and make arrangements for quick delivery in quantities to suit all users; and continue the great push till coke becomes the desire of the nation.

SCOTTISH JUNIOR GAS ASSOCIATION.

[Mr. David N. Garrie, of Cowdenbeath, reviews current methods of purification, and details the system adopted at Cowdenbeath.]

The Eastern and Western Districts of the Scottish Junior Gas Association held a joint meeting on Saturday, Jan. 16, at Edinburgh. Mr. A. McG. CLARK, President of the Eastern District, occupied the chair.

PRINCIPLES AND PRACTICE OF PURIFICATION.

By DAVID N. GARRIE, of Cowdenbeath.

[Extracted.]

TAR.

Though tar is being continuously deposited from the hydraulic main to the condensers, a proportion persists stubbornly through the ammonia scrubbers to the purifiers, as tar fog; the temperature being far below the liquefaction point of tar. Tar fog consists of tiny bubbles of gas enclosed in a film of liquid tar, and these float in the gas stream until caused to impinge on a metal surface, whereby the film is ruptured and the gas liberated (cyclone extractors, Pelouze and Audouin extractor, &c.), or the tar fog may be drenched out by shock cooling.

A method of tar extraction incorporated in Otto Hilgenstock direct recovery coke oven plants was brought to the notice of the Institution of Gas Engineers by G. T. Purves, of Auchengeich, in 1914, but seems to have escaped attention. A stream of water issuing vertically downwards from a nozzle into the gas stream in parallel flow is brought into intimate contact with the gas by means of a throat in the vertical gas main. The high velocity water bursts the tar vesicles by friction, allowing the enclosed gas to escape, and causing the tar to form a continuous liquid. A tank below, having an outlet for gas, collects the liquid. The tar settles to the bottom, and is drawn off by a syphon, and the water is recirculated at 80 lbs. pressure by means of a centrifugal pump. The crude gas enters the tar spray direct from the foul main, and is at a temperature above its dewpoint, while the water in continuous circulation picks up a gradually increasing quantity of fixed ammonia (NH_4Cl) and a small quantity of free ammonia. A removal of 95 p.ct. of the tar is claimed for this method, which would seem to be highly advantageous in town gas purification on account of the production of drier tar (by avoiding emulsification) and the fact that the lighter oils are permitted to travel forward to the cool end of the system.

AMMONIA.

A solution of ammonia tends to set up an equilibrium between the ammonia in solution and that in the gas stream above it; consequently it is possible for gas containing a certain quantity of ammonia to pick up more from a correspondingly stronger solution. This is the reason for the adoption of counter-current flow of wash-water in scrubbers, brush scrubbers, and the like. The principle should also be extended to the sequence of apparatus, but it is common enough to find this important point ignored.

A usual practice is to circulate liquor from a common collecting tank through the hydraulic and other mains, to maintain the seals; and almost invariably the temperature of the liquor rises to such an extent that serious loss of ammonia occurs, or, at the best, excessive duty is thrown on the brush scrubbers.

WET PURIFICATION.

The Koppers Company, of America, have developed a process of liquid purification using a dilute solution of soda ash. The operation of the process is simple, consisting of scrubbing the foul gas with a relatively large volume of a 3 p.ct. solution of sodium carbonate, which results in a more or less complete removal of H_2S and HCN, and a substantial reduction of sulphur compounds other than H_2S. The washing liquid is aerated with large volumes of air, whereby the H_2S is driven off, and absorbed by oxide of iron, or the sulphur is liberated as such, and filtered off, leaving the liquid available for further extraction of H_2S, &c. Loss of soda occurs through the accumulation of sodium sulphate, thiosulphate, and thiocyanate; the solution having ultimately to be renewed.

It is probable that the amount of CO_2 present in the foul gas will affect the efficiency of extraction; and further, it would appear that the effluent from this process is similar in some respects to those from sulphate plants complained of by Dr. Lewis Bailey.

The process is fundamentally similar to that of Claus, with the advantage that the sodium salts formed (as against those of ammonia) are much less liable to dissociation. Again, the reactions responsible for the removal of CS_2 are identical with those occurring in lime purification. The process has been favourably commented upon by Dr. E. W. Smith and T. C. Finlayson (see " JOURNAL " for Nov. 11, 1925, p. 355), and working results have been published by T. R. Cook, of Southport (see " JOURNAL " for Nov. 18, 1925, p. 432).

ACID WASHING.

Although the use of acid is periodically advocated, considerable antagonism to the idea appears to exist. Such objections as depreciation of illuminating value and calorific value, and the danger of carrying forward acid spray, have been raised; but perhaps the most potent is the deposition of tar in the washer, whereby a marketable sulphate cannot be obtained. All these objections appear to be groundless in the light of experience with direct recovery coke oven plants which embody this principle.

While it is conceivable that the use of free acid might be attended with certain disadvantages, it is interesting to learn that in 1840 the use of the sulphate or chloride of lead, manganese, iron, or zinc, either moist or in solution, was common. Though these salts removed some of the H_2S as well as the ammonia, the trouble of revivifying them, and their increasing cost, led to their disuse; but it is curious that solutions of calcium salts do not appear to have been used, although Laming patented the use of oxide of iron containing sulphate or chloride of calcium for the simultaneous absorption of ammonia and H_2S.

In this country recovery of cyanogen is confined solely to that present in the gas; but on the Continent, notably in Germany, spent oxide is a common source, and not infrequently spent oxide is sold in this country to Continental agents on the basis of its prussian blue content. Cyanogen recovery is the exception rather than the rule in our gas-works, and a number of plants in operation during the war have been shut down, for financial reasons. In the case of works without cyanogen recovery, the first of the H_2S purifiers operates under conditions approximating to those of the polysulphide process for cyanogen extraction.

SULPHURETTED HYDROGEN.

Crude coal gas leaving the retorts (when making some 10,000 c.ft. per ton from average Scotch coal) may be taken to contain about 1200 grains of H_2S per 100 c.ft., some 20 p.ct. being taken up in the scrubbing plant along with corresponding quantities of CO_2 and HCN.

Despite numerous investigations, the mechanism of the reactions occurring in oxide purifiers is still speculative. Whereas in the laboratory pure hydrogen sulphide and clean oxide are used, in actual practice the H_2S is accompanied by quantities of tar fog, ammonia, cyanogen, and oxygen along with the bulk of the gas containing CO_2, and the whole passes through oxide having as much as 50 p.ct. free sulphur. The effect of those impurities on the oxide, sulphur, and on each other, results in a number of simultaneous and consecutive reactions, the elucidation of which has never been completely achieved.

The reactions which occur in the sulphiding of oxide are indicated by the equations:

$$(a)\quad Fe_2O_3 \,.\, H_2O + 3H_2S = Fe2S_3 + 4H_2O$$
$$(b)\quad Fe_2O_3 \,.\, H_2O + 3H_2S = 2FeS + S + 4H_2O$$

According to Godol, (*a*) predominates under alkaline conditions and (*b*) under acid conditions.

An oxide begins to lose its activity as soon as it is put into use; its sulphur content is cumulative, and as more and more H_2S is decomposed, the amount of active oxide is decreased by transformation into sulphides. These, however, regenerate the oxide on exposure to oxygen.

$$(a)\quad 2Fe_2S_3 + 3O_2 + 2H_2O = 2Fe_2O_3 \,.\, H_2O + 3S_2$$
$$(b)\quad 4FeS + 3O_2 + 2H_2O = 2Fe_2O_3 \,.\, H_2O + 2S_2$$

Each of these reactions is accompanied by the evolution of heat. A rise of gas temperature of 5° Fahr. or more may be observed between inlet and outlet.

The conditions governing the activity of commercial oxides towards sulphuretted hydrogen have been the subject of much experimental work, and briefly are these: Water content, temperature, presence of oil or tar vapour, acidity or alkalinity of the oxide, and, most important of all, the physical structure and surface condition of the oxide.

Dunkley and Leitch in a recent contribution (see " JOURNAL " for Aug. 19, 1925) observe that, with the oxides studied, each

had an optimum water content (more or less affecting the oxide adversely), and advance the hypothesis that the oxide particle distends like a damp sponge, increasing the exposed surface and consequently the activity, until a point is reached where water-logging takes place. Temperature has relatively little effect, a gradual increase being shown from 45° to 120° Fahr., while the presence of tar causes rapid decrease of activity, probably by filling the interstices between the particles. Finally, the same authors observe that rendering the oxide-sample acid (up to 10 p.ct. H_2SO_4) or alkaline with Na_2CO_3, made no appreciable difference on its activity, but they mention the fact that this is contrary to practical experience.

In addition to these factors governing the sulphiding and revivification of oxide, secondary reactions are liable to occur, resulting in the formation of iron disulphide (FeS_2), which does not revivify, and ferrous sulphate, which has an acid reaction. Since in the majority of works HCN, O_2, and NH_3 (2 to 3 grains) pass forward to the purifiers, the reactions of the polysulphide process of cyanogen extraction occur simultaneously with the primary reactions, and, further, since the amount of NH_3 is insufficient, some prussian blue is produced.

Prussian blue, by coating the oxide particles, is undoubtedly a common cause of loss of activity; and its decomposition by alkalies to form a soluble ferrocyanide is the rationale of by-passing the brush scrubber to cure an inactive purifier. Its presence, too, explains the complete absence of ammonia in town gas.

Some idea of the complexity of the reactions occurring may be obtained from a consideration of the composition of the effluent draining from the purifiers. This may contain a trace of insoluble prussian blue, thiosulphate, ferrous sulphate, and relatively large quantities of sulphocyanide. An actual examination gave the following results:

Free ammonia	2	Iron = 30 grains Fe_2O_3 per gall.	
Fixed ,,	75	Total sulphur = 265 grains S per gall.	
Total	77 grains per gall.		

The presence of this large quantity of sulphur might well account for the difficulty of working-up the oxide to a saleable sulphur content.

In small works where the financial resources are restricted and technical control is of a somewhat haphazard nature, the introduction of expensive and elaborate purifying plant is out of the question; but in the light of the foregoing principles, a lot can be done with the plant usually installed. An actual case may be of interest.

COWDENBEATH.

At this works the gas-making plant consists of horizontals and B.W.G. plant producing annually 100 million c.ft. of 400 B.Th.U. gas. The warm unpurified water gas is admitted at the foul main before the condensers.

After some repair and adjustment of the compensator and retort-house governor, considerable relief from the trouble of stopped ascension pipes was obtained, and the circulation of liquor, which had been necessary to maintain the seals, was discontinued. The liquor, which previously reached a temperature of some 60° C., but a strength never higher than 3½° Twaddell, was thus allowed to remain cold. Loss by evaporation was reduced, and a reduction of clean water supply to the brush scrubber was made possible.

The sequence of plant was the usual one—viz., air condensers, exhauster, Livesey washer, tower scrubber, and brush scrubber, while the overflow from each was led to a common collecting tank. This circumstance, as well as the lack of pumping machinery, and on account of equality of level between scrubber and washer, made adherence to the principle of counter-current flow impossible. The procedure eventually adopted was as follows:

Finished liquor for sulphate was pumped at intervals to an elevated storage tank, and from a convenient point on the pipe line a continuous supply was passed back to the Livesey washer, overflowing to the collecting tank at 7° to 8° Twaddell. When not otherwise in use, the liquor pump was slowed down, and the liquor delivered from the collecting tank to the top of the tower scrubber through a 1 in. pipe, suspended beneath the outlet end of which was a horizontal 6 in. diameter lead plate acting as a spreader. As stated, the outflow returned to the collecting tank.

The brush scrubber was fed with a constant stream of clean water in sufficient quantity to keep the first compartment at 0° Twaddell. The combined liquors as used in the sulphate plant were regularly 5° to 5½° Twaddell (approx. 2·0 grammes total NH_3 per 100 c.c.), and were considered highly satisfactory, while the NH_3 passing to the purifiers amounted to 2 to 3 grains per 100 c.ft.

Since the capacity of the condensers was on the small side, deposition of tar, as far as the purifiers, was acute; but with no spare plant, little or nothing could be done to reduce the annoyance. The gas stream, too, was cooling right to the holder, but both inside and outside the works naphthalene troubles were practically unknown. This was due, most probably, to dilution with such a large proportion of blue gas (45 p.ct.).

The four purifier boxes were each 25 ft. square by 6 ft. deep, containing five 1 ft. layers of oxide, with hurdle grids and downward flow. Several brands of artificial oxide were in use, and a comparatively large stock of used material had accumulated, because of the difficulty experienced in working it up to a sufficiently high sulphur content. Indeed, on the rare occasions when this material was sold, it was on the basis of its prussian blue content, which ranged from 4 to 6 p.ct. From small-scale experiments, it was learned that the material was active after washing with alkali, but the difficulty was to apply this inexpensively on the large scale. Drenching the oxide in the boxes with ammoniacal liquor was tried, without any marked success, but eventually the following satisfactory scheme was evolved.

The boxes were kept permanently in the rotation 1—2—3—4. No. 4 was filled with new oxide (Ferrox), and served as a catch box. Nos. 3, 2, and 1 were filled with old material, as far as possible with increasing sulphur content, and with which was mixed, as intimately as could be done by hand, about 3 p.ct. of caustic lime.

It was found that after spraying the oxide with water when filling, the liquid draining from the box contained notable quantities of sulphocyanide and ferrocyanide. When in action the lime becomes quickly carbonated, but still serves to maintain the oxide in a state of neutrality, should it tend to become acid.

No. 1 takes first the foul gas containing H_2S, HCN, NH_3, O_2, and CO_2. At first there is complete absorption of H_2S; but as the material becomes fouled, increasing quantities are passed on to No. 2. HCN, NH_3, and S interact to form sulphocyanide, reducing the HCN to 4 grains per 100 ft. The large volume of condensate derived from the cooling gas tends to wash out the soluble cyanogen compounds, and this is assisted periodically by treatment to be presently described. The gas passes in series through the four boxes, and at each outlet is placed an absorption bottle containing lead acetate solution, and supplied from a test cock. The time required to darken the lead solution gives a rough but reliable guide as to the condition of the purifier.

When traces of H_2S are found at the outlet of No. 3, No. 1 is cut out of the series, the suction side of a small rotary blower (200 c.ft. per hour) coupled to the gas outlet pipe, and air drawn downwards through the oxide for 24 hours, live steam being blown in simultaneously through a hole in the corner. Thus, the most vigorous oxidizing conditions are applied to the oxide, while condensing steam counteracts any liability to fire, and also dissolves out soluble compounds. After this operation, No. 1 is switched back first in the series.

It was anticipated that by effecting revivification by means of the blower instead of drawing in air at the condensers, a reduction in oxygen content and a slight improvement in gas quality would result. This was nullified to a large extent because of the bugbear of uneven seals, a policy of regulated over-pulling having to be adopted, giving 0·7 p.ct. oxygen in the coal gas. Nevertheless the performance of the purifiers was distinctly improved; the contents of No. 1 box after the first run rising from 35 to 42 p.ct. of S, which was the highest sulphur content recorded in these works.

While a detailed discussion of the question of CS_2 removal is outside the scope of this paper, one might mention that each sample of rust (from various parts of the country) contains fixed ammonia and free sulphur. Now, since it is highly improbable that gas passing through oxide containing prussian blue would contain NH_3 as such, and since engineers throughout the country are compelled by statute to maintain the gas supply free from H_2S, it does not seem too venturesome to suggest that HCN and CS_2 might be sources of the NH_3 and S_2 found in rust. If this point be debatable, it will at least be admitted that the rust menace is a serious one, and that for this reason alone the production of gas of a higher degree of purity with regard to O_2, HCN, and sulphur compounds must be attempted.

Discussion.

The CHAIRMAN said he agreed with Mr. Garrie that gas should be distributed entirely free from sulphur compounds, and that they might have to revert to some of the earlier methods of purification, such as washing the gas with rectified naphtha, as suggested by Young in 1887.

Mr. R. GRAY, President of the Western District, emphasized the necessity for the elimination of tar fog before the wet purification plant; otherwise the efficiency of both wet and dry purification was impaired. Referring to the method of revivification adopted at Cowdenbeath, he inquired if this did not cause caking of the oxide.

Mr. GARRIE said that it was liable to cause increased caking, but the increase was not serious.

Mr. KEILLOR (Dunfermline) suggested that water vapour should be included in the list of impurities, for corrosion occurred only in the presence of moisture. He disagreed with the statement that temperature had relatively little effect on the activity of an oxide. He asked if, in the method of revivification described, any trouble had been caused by firing of the oxide.

Mr. GARRIE agreed that water ought to be included as an impurity, but the possibility of dehydrating the entire output of gas was remote. He agreed with Mr. Keillor that corrosion probably occurred at dew-point. He had expected to be taken to task for the statement regarding the effect of temperature on the activity of oxide. The statement referred to was quoted verbatim from Dunkley and Leitch's article. The general body of opinion was in favour of a working temperature of about 70° Fahr. for purifiers. There was not the least trouble with firing. The difficulty lay in loss of activity due to the presence of prussian blue.

Mr. HALL (Glasgow) supported the view that the physical structure of oxide was the all-important factor, and with this the water content was intimately bound up. He suggested that increase of

activity with rise of temperature might be due to the evaporation of excess moisture, after which the influence of temperature was not so marked, provided the correct water content could be maintained.

Mr. GARRIE said it was difficult to control the moisture content of the oxide, because of temperature differences in the boxes. The boxes at Cowdenbeath were in an exposed position, resulting in a temperature drop of about 3° Fahr. between the gas entering and that leaving the purifiers. Notwithstanding the deposition of surprisingly large volumes of water, the oxide had been found to lose moisture from 20 p.ct. at filling to 12 p.ct. at emptying.

Mr. SCOTT (Cowdenbeath) remarked that an advantage of working the purifiers as described by Mr. Garrie was that one could concentrate on working-up one box at a time, whereas with backward rotation the oxide in all four boxes became spent at one time.

Mr. VASS (Perth) said that, with backward rotation, it was preferable to empty alternate boxes periodically. His own practice was to empty two boxes in the spring, and two in the autumn. In any case, frequent change of oxide was desirable, as many cases of fractured side plates could doubtless be traced to the swelling of the purifying material during operation.

Mr. CLARK proposed a vote of thanks to Mr. Garrie, to which there was a hearty response.

After the meeting, the members of the Western District were entertained at tea by the Eastern District.

USE OF COKE FOR DOMESTIC PURPOSES.

By Dr. E. W. SMITH, of London.

[Abstract of an Address before the Yorkshire Junior Gas Association on Jan. 16.]

Dr. SMITH asserted that the domestic demand for coke can be made the most valuable of all demands; and where gas companies desire to cultivate this outlet, the primary necessity is for them to put their houses in order wherever this is requisite, and produce material which can be stated, with all truth, to be really satisfactory free-burning smokeless fuel. It is not a healthy thing, however, to push the use of coke for domestic purposes unless the coke is really satisfactory; and consequently the first thing to be done by gas undertakings is to produce a fuel that will give real satisfaction when used properly. There are two sides to this question. The first comes under the heading of "Production," and the second under that of "Utilization." Any properly working system of carbonization general in the gas industry can be made to produce a coke which would be sufficiently satisfactory for domestic purposes, if everything is done that can be done to make it so. There are gas undertakings that are doing a great deal in this direction. By far the majority have not yet started.

Far-sighted gas engineers are giving a great deal of attention to this matter. There are others who are only dealing with it spasmodically, and in a half-hearted way; and there are yet other engineers who are doing nothing at all. Those who are really tackling the problem are meeting with such success that they are now wondering what will happen when the demand exceeds the supply. He did not propose to deal with that situation now. It is a very happy situation, and one which is not too difficult to handle.

It has been frequently stated that the coal from which coke is made should be as clean as possible. The coke should be carbonized, but not over-carbonized. It should be as free as possible from water, and screened within narrow limits of size, various sizings being sold for different purposes—such as central heating, anthracite stoves, and the domestic fire. All these points are worthy of full discussion. It is also worth while discussing whether or not it would pay to blend coals, in order that cheaper coals may be employed, and in order that the combustibility of the resultant coke may be increased. Blending requires grinding and thorough mixing. Without such procedure, blending is wasteful, and in effect harmful. Blending can be more readily carried out in intermittent systems of carbonization than in continuous ones, although there is no difficulty in arranging for methods of blending in connection with continuous verticals.

In connection with the subject of utilization, those engineers who intend to cater for the demand for domestic coke would do well from the beginning to put an intelligent man on the district, who would advise consumers as to the correct size of coke to use, the best way of lighting the fire, and the best conditions under which to burn the coke. It is no use supplying $\frac{1}{2}$ to $\frac{3}{4}$ in. material for the open domestic grate of the semi-well type, although this particular size is ideal for the closed central heating boiler, or for the anthracite stove; nor would the larger material of $1\frac{1}{2}$ to 3 in. be of much use in the anthracite stove or the small central heating boiler.

The difficulty often arises that the consumer has only one coal shed or store, of limited capacity. He has no room for two kinds of fuel. It is very necessary that the gas undertaking should be prepared to deliver direct from the gas-works quantities down to single bags; and in his belief it would pay the gas undertaking to allow the consumer to retain the bag until the next delivery, in order that he could keep his coke separate from the coal store. The whole subject is one that is worthy of a great deal of research; and he hoped the Institution, through the Leeds University, would do everything possible to prosecute various branches of such research.

A New German Book.

We have received from the publishers, the Verein Deutscher Ingenieure (Association of German Engineers), a volume entitled "Entgasen und Vergasen, Neuzeitliche Brennstofftechnik." It is published as a special supplement to the periodical of the Association, at the price of Mk. 9, in paper cover. By means of papers by various authors, either original or previously read before technical associations, sundry aspects of carbonization, especially low-temperature, and gasification are dealt with, mainly from the point of view of the economic use of German fuel stuffs, including not only coal, but also inferior materials such as brown coal, peat, and wood. Individual papers deal with the economics of various processes, the preparation of the fuels, questions of long-distance delivery, and the quality of primary and secondary products. The chemical structure of coal is another subject, with its bearing upon the main theme, and the liquefaction of coal and the relationship between different fuels and the methods of using them are other matters which receive attention. An abstract is included of the paper read at the last meeting of the German Gas Association by Dr. Karl Bunte, the Secretary, and a short account from "Glückauf" of results obtained with the Barnsley low-temperature plant. The text is illustrated with 145 diagrams and sketches.

Use of Methyl Salicylate in a Flow-Meter.

In a communication to "Industrial and Engineering Chemistry" for January, Mr. R. H. K. Foster describes and illustrates a method of using methyl salicylate in a flow-meter. He remarks that various liquids have been suggested for use in measuring the differential pressure through the capillary of a flow-meter—among them water, mercury, and glycerol. The principal disadvantage with water is its inability to wet the tube if there happens to be a film of grease on the tube, thus causing error in reading. The same is true of glycerol; and, in addition, glycerol, being an extremely viscous liquid, is not so sensitive to sudden fluctuations. Methyl salicylate (oil of wintergreen) dissolves any oil or grease film on the tube, thereby forming a perfect meniscus. It has a very low vapour pressure, and will last indefinitely. Because of its low rate of evaporation, the diffusion of its vapour into the air or gas stream is negligible. It is also easier to fill the flow-meter with methyl salicylate, and to remove air bubbles from the inverted U-bend, than when water is used. Once the flow-meter has been filled, and the proper adjustment has been made, no further attention should be necessary, except an occasional check on the calibration. The density will change with the temperature; and therefore the apparatus must be calibrated at different temperatures. Since methyl salicylate dissolves rubber, glass is preferable; but if a rubber tube and screw clamp are employed instead of a glass stopcock, it will be necessary to re-adjust the zero level of the liquid once a day at least. Methyl salicylate can be employed for all purposes for which water is suited, without introducing some of the less desirable features which the use of water presents.

Composition of Coal.—An account is given in Paper No. 17 of the Safety in Mines Research Board, by V. H. Legg and R. V. Wheeler (H.M. Stationery Office, Adastral House, Kingsway, London; price 1s. net), of plant cuticles in coal. The cuticle in coal (of which this paper makes a preliminary study) is the outer protective covering of leaves and stems common to all living plants. It is particularly resistant to decay, and survives almost unchanged among the decaying vegetation that ultimately forms coal. It is now found preserved in many bituminous coals, and gives characteristic chemical properties to them.

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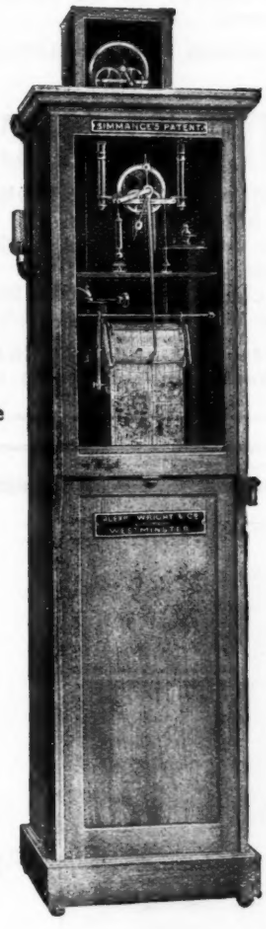

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See "Gas Journal" Dec. 2, 1925, Page 592.

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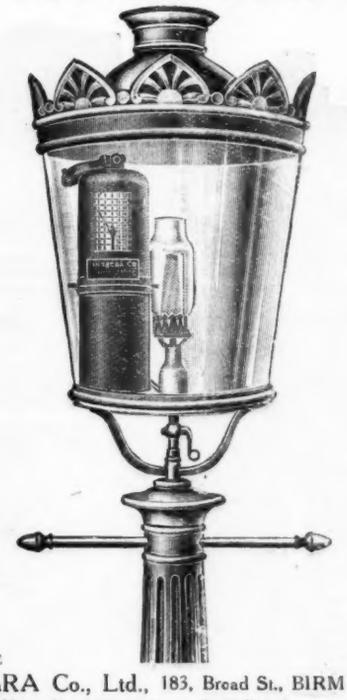

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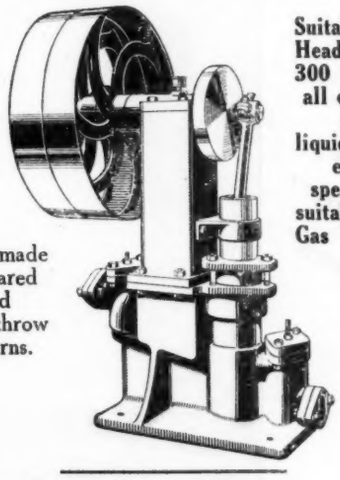

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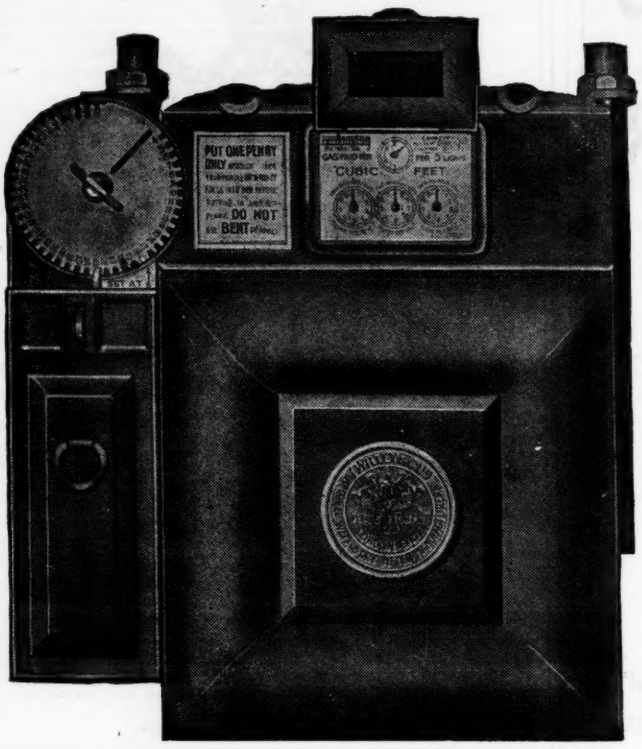

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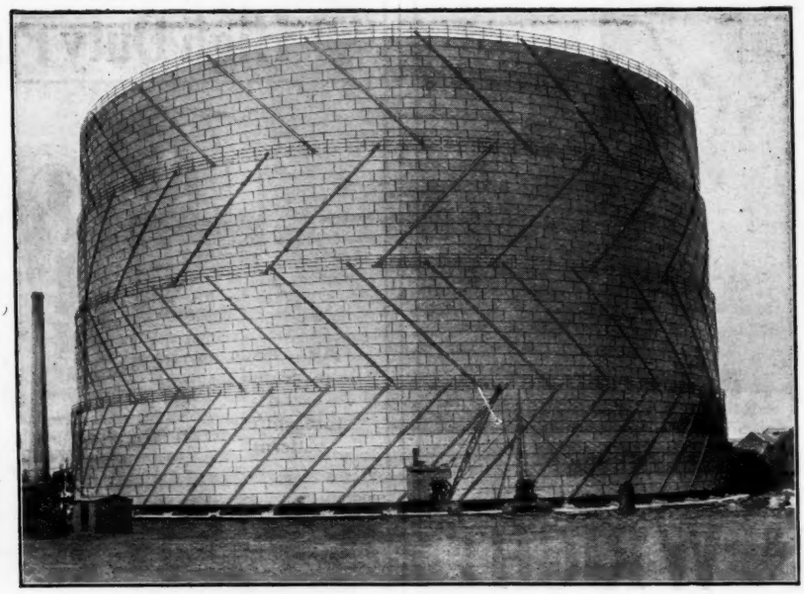

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Does the Gas Industry Need Overhauling?

SIR,—Your leading article under the above heading in the issue for Dec. 9, and "X's" comments in the current issue of the "JOURNAL," prompt me to vary your question in the following manner. Does the undertaking which *you* direct need overhauling? I venture to say that the vast majority of principal officials will answer in the affirmative. Then why not do it? It is here that the real obstacle is met with.

The gas industry for long has enjoyed such a large measure of protection and prosperity, and, moreover, is such a source of popular investment in the localities where gas companies exist, that the administrative bodies have become obsessed with the principle that nothing on earth must intervene to endanger the even tenor of the dividend rates. They forget entirely that they are a trading concern, and expected to take risks in anticipation of profits. They also forget the action of their forebears who, being men of courage and resource, in the first instance risked their capital in a venture that was by no means at that time as certain of success as what to-day lies within the reach of many undertakings in the form of extending outwards to country areas and near-by villages, where gas consumption can be started on a scale as large to-day as, when a century ago, many of our large undertakings had their beginning.

Distance distribution by small trunk leads and high-pressure motors into storage or transformer chambers for normal distribution is a practical proposition, and may only need additional "powers" to extend areas of supply for its consumption. It is reasonable that a super rate be charged in such cases; but gas is now so indisputably a necessity that consumers do in fact pay, but grumble at, very high prices for the services rendered.

Why should the gas industry not place a "grid" over the country, and allocate to respective works areas for what may be termed cross-country supply? Another method would be for the parent source to supply in bulk, and to organize small companies as distributing concerns in such areas. That gas can do better for the general public than electricity is common knowledge to those engaged in the industry, but it has yet to be drilled into the mentality of the man in the street

The wider distribution of gas into country areas will do much for the development of village industry; and anyone who wants electricity for lighting can, by use of a gas engine generating set, serve himself at lower cost. The main question is, however, the provision of the necessary capital for such purposes. Such companies must be prepared to provide not only the supply, but all reasonable equipment at an inclusive rate, and recoup the outlay by charging such a price for gas as will not only yield the ordinary return necessary on the outlay, but also a sum which should be set aside as a sinking fund for the redemption of the capital sunk. This seems to me to be one of the most feasible ways of doing what apparently the Government insist shall be done by means of their electricity proposals.

There are probably many areas where small manufacturing stations to-day might with advantage be closed, and become merely distributary stations for gas received in bulk from other sources.

Unless the gas industry is to be confined to its present restricted areas, it is of supreme importance that advantage should be taken of the present circumstances to see that any privileges for wider distribution of electricity are made common to the gas industry, and that no restrictions shall be imposed, to the disadvantage of the latter industry, upon the exploitation of areas falling within the electrical "grid."

W. R. HERRING.

Howard House,
4, Arundel Street Chambers,
Strand, W.C. 2, Jan. 21, 1926.

Institution Education Scheme.—Certification of Gasfitters.

SIR,—With a view to meeting the cases of those adult and experienced gasfitters who are unable for any reason now to attend classes, but who desire certification, it was decided at the last meeting of the Advisory Committee to allow them to sit for the Final Examination in Gasfitting without such attendance, subject to the following restrictions:

1.—The candidate must not be under 25 years of age on the 1st of January preceding the date of the examination.
2.—The concession shall apply only to the examinations in 1926 and 1927.

WALTER HOLE,
Organizing Secretary.

Wharfedale, Barton,
Torquay.
Jan. 20, 1926.

MISCELLANEOUS NEWS.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

Report of Annual Shareholders' Meeting.

The Annual Meeting of Proprietors of the Aldershot Gas, Water, and District Lighting Company was held at Farnborough to-day—Mr. R. W. EDWARDS (Chairman and Managing Director) presiding.

The SECRETARY (Mr. F. A. Ricketts) read the notice convening the meeting; and, after the minutes of the previous ordinary meeting, and of an extraordinary meeting held in April last, had been confirmed, the Chairman rose to move the adoption of the Directors' report and accounts for 1925.

DIRECTORS' REPORT FOR THE YEAR ENDED DEC. 31, 1925.

The Directors present a statement of the Company's accounts for the year ended Dec. 31, 1925, from which it will be seen that the revenue from all departments was £201,698 0s. 1d., and the expenditure £164,159 16s. 6d., leaving a surplus of £37,538 3s. 7d.

After allowing for dividends on the consolidated preference stock, interest paid to the bank, and on redeemable mortgage bonds and debenture stock, as well as the statutory dividends paid for the half-year ended June 30 last—viz.: £7 3s. 6d. p.ct. per annum on the "A" stock, £5 13s. 6d. p.ct. per annum on the "B" stock, and £5 p.ct. per annum on the "C" stock—the Directors recommend statutory dividends of £6 16s. p.ct. per annum on the "A" stock, £5 6s. p.ct. per annum on the "B" stock, and £5 p.ct. per annum on the "C" stock, for the latter half of the year, all less income-tax.

The markets for residuals have been depressed, and are reflected in the decreased revenue from these sources. Otherwise, the business in all departments has been generally satisfactory, and shows much progress.

Mr. Arthur E. Cutforth, F.C.A. (of Messrs. Deloitte, Plender, Griffiths, & Co.), retires by rotation, and is willing to serve again, if re-elected.

The retiring Director is Mr. Charles Pelham Crookenden, F.C.A., who, being eligible, offers himself for re-election.

R. W. EDWARDS, Chairman.

Jan. 18, 1926.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN, in his address to the shareholders, said: In submitting the Directors' report and accounts for the year 1925, I would venture, in the first place, to anticipate your permission to take the same as read. As the first statutory undertaking to hold its general meeting for 1925, I feel privileged to address you; and I trust my remarks may be of interest, not only to the shareholders, but to those potential investors who have yet to realize the stability of an undertaking possessing gas, water, and electricity powers. I commence with a review of our premier department—

GAS.

The progress for the year has again been satisfactory, the sales having increased by nearly 7 p.ct. (6·8 p.ct.), which, with the 1924 advance of 12½ p.ct., brings our cumulative increase for two years to over 20 p.ct. (20·15 p.ct.). We have added 533 consumers, and fixed 1733 pieces of apparatus, consisting of: 661 cookers, 842 fires, 230 hot water appliances—in total, an increase of 31·3 p.ct. over 1924. This continued expansion, largely in the fixing of apparatus in existing consumers' houses, is a record of activity by our sales department. It is the most advantageous form of gas business expansion, to increase the consumption per service, as it is more economical in its capital expenditure. Of course, I do not suggest that we restrict our activities to the addition of apparatus to existing services. On the contrary, the fact that we have added in two years nearly 1800 new gas consumers (1783) shows that the sales department is giving attention to both forms of new business. The outlook in our districts for expansion is encouraging. Undoubtedly the high cost of building is the reason for the prevailing design of houses of a more modest character; and it is part of the scheme that labour-saving devices should be adopted to enable the smaller house to be more elastic in its utility. Consequently, gas takes the major part in these labour-saving arrangements.

Residuals have played a poor part in the year's finance. Coke, breeze, tar, sulphate of ammonia, &c., have between them yielded a revenue of only £28,998 15s. 2d., as against £40,179 9s. 4d.—a reduction of £11,180 14s. 2d. This sum has had to be made up from other channels. Coal cost an average of 30s. 8·25d. per ton. Products yielded 14s. 1·91d. per ton of coal carbonized, equal to but 46 p.ct. of the cost of coal. This brings up the net cost of coal to 16s. 6·34d. per ton, as against 9s. 7·71d. in 1924. Thus the difference in the net cost of coal is (within a few pence) entirely due to the depreciation in the value of residuals. It is hoped that the current coal question will resolve itself into a solution of better and cheaper coal. One of the great troubles during, and since, the war has been the excessive amount of incombustible matter contained in certain classes of coal; and there is no doubt that gas undertakings will be compelled to seek collieries who are in a position to offer dependable coal with a low inert content. It will, there-

fore, be up to certain colliery owners to overhaul their arrangements, to retain their old contracts. I am quite sure no gas undertaking operating on modern lines can in the future afford to carbonize coal of an inferior quality—unless it is practically given to them.

GOVERNMENT AND ELECTRICITY.

Before I leave the Gas Department, I would like to comment on the scheme recently announced by the Premier, in connection with electricity. For obvious reasons, it is difficult for me freely to criticize it, as I am also an electricity administrator; but I have no hesitation, as one who has been 42 years in the gas industry, in saying that this new electricity scheme will be the salvation of gas, for it will inspire and unite the whole body in one combined interest. Undertakings which have hitherto refrained, because of sentimental reasons, from permitting themselves to be attached to larger undertakings, will not hesitate, in the interests of their consumers and shareholders, to merge their undertakings with greater or more efficient concerns. Faith is the substance of things hoped for; and I have every confidence that the gas industry will prove itself eminently equal to meet the fiercest competition of a combined electrical scheme, which one can only describe as a parent company with Government backing. I have no objection to the parent company arrangement; but I have an objection to the Government guarantee, because it will give the electrical industry an advantage over the gas industry in the raising of cheap capital, which is so absolutely essential to economical development. The gas industry asks only for a fair field and no favour; and we hope to retain our freedom to develop our business on the best lines, for the greatest benefit to the consumers.

WATER.

In this department the progress has again been modest, but satisfactory—77 new consumers having been added. There will be some alterations in the plant and buildings to be carried out at one of our pumping stations, which your Directors are carefully considering. Other than these, I do not anticipate any heavy expenditure, excepting extension of mains. The pumping stations, reservoirs, and plant generally have been maintained in most satisfactory condition.

ELECTRICITY.

This department shows a net increase in the sales, for 1925, of 21·6 p.ct. Since 1919, a period of six years, the sales of electricity have advanced by nearly 400 p.ct. (384 p.ct.). The number of consumers added last year was 220, and of pieces of apparatus fixed 113. Although our electrical powers are not coterminous with all our gas district, we have, notwithstanding, a considerable area earmarked for the supply of electricity. Electricity is, as you can see, developing rapidly; and there appears to be a prospect of its continuing to grow substantially in the coming years to such an extent that the Directors are considering their future policy very closely. Naturally, as things are in a somewhat fluid state, owing to the Government action, we must be guided by what is ultimately determined by Parliament. I have already said that, in my view, electricity should fight its own battle, unaided or uninfluenced by the Government; but if the new scheme (consisting, it is said, of 60 odd super-stations, and a huge grid of high-pressure mains over the country) becomes a fact within the next five or ten years, it will mean that the identity of nearly all local stations will become submerged. There may be, here and there, an economy in generation; but I doubt whether ultimate economy is going to be effected in transmission and distribution. At any rate, as electricity has become, more or less, a political question, it would, perhaps, be wise for me not to pursue the subject further.

CAPITAL.

Following my last year's practice, I now deal with the statement as to our capital. For the three undertakings, the amount of capital authorized is £1,056,367 14s. 2d.; and of this there has been received £718,296 12s. 4d. Deducting £40,989 8s. 3d. added on consolidation, under the powers of our 1909 Act, there remains a credit of £1539 10s. 5d. After allowing for depreciation (£5517 19s. 7d.), the net total sum expended is £675,767 13s. 8d., or £37,598 6s. 2d. net expended in 1925. Of this latter sum, there has been spent on the following departments:

	P.Ct.
Gas	74·2
Water	2·1
Electricity	23·7

Or, again, further analyzing the expenditure under the heads of the various works:

	P.Ct.
Lands, new buildings, and works	59·7
New mains and services	28·5
New meters	1·6
Machinery	9·1
Transformers, &c.	1·1

We are getting on with our new gas extensions, which I outlined in my address last year; and by the end of 1927 we hope to have completed the greater portion of the new works now in progress, which include the reconstruction and extension of retort houses, the reconstruction of a gasholder at Fleet, a new 3-million c.ft. gasholder at Ash Road, and an extension of our chief offices, which latter will more than double the present facilities. It can easily be realized that, with the progress we are making in the addition of new consumers—which totalled 830 last year, and 1430 the year before—the accommodation provided in our present offices over 23 years ago has become insufficient for to-day and the near future.

There is, I think, very little else of importance to add. I would, however, remind the "A" and "B" stockholders that their dividends are subject to the sliding-scale, which is governed by the standard price fixed under the provisions of the Gas Regulation Act of 1920. The standard price is liable to revision on the application of either the public or the Company. Quite recently four public authorities in our area applied to the Board of Trade for a revision of this Company's standard. An inquiry was held; but the result has not yet been made known. It will doubtless mean a reduction in the standard price, and consequently the dividends will be lower on the "A" and "B" shares, and likewise the bonus to co-partners reduced. I do not think there is anything further to say, except again to compliment our Chief Accountant and his staff on the preparation of the accounts and the expeditious closing-off, which has enabled this meeting to be held one day earlier than last year. There are also the Secretary and his staff, who have combined to achieve the utmost; and their efforts will permit the dividends being posted immediately after this meeting closes. Finally, there is the Audit Accountant, who has so loyally co-operated in the work of checking and verifying the internal details of our accounts. I now formally move that the Directors' report, with the statement of accounts for the twelve months ended Dec. 31, 1925, be and are hereby adopted, and that the dividends as therein recommended be and are hereby declared to be forthwith payable to the proprietors.

The motion was seconded by the DEPUTY-CHAIRMAN (Mr. Thomas A. Braddock), and carried unanimously.

The retiring Director (Mr. C. P. Crookenden, F.C.A.) was unanimously re-elected, as was also the retiring Auditor (Mr. Arthur E. Cutforth, F.C.A.).

Votes of thanks to the Chairman for his conduct of the meeting, and to the staff for their excellent work during the year, concluded the proceedings.

COST OF ELECTRICITY IN THE CITY OF LONDON.

Shall Stepney Council Come In?

At a Meeting of the Court of Common Council of the Corporation of the City of London, held at the Guildhall, on Thursday last, a number of resolutions—submitted from the various wardmotes on St. Thomas' Day (Dec. 21, 1925), upon the occasion of the annual election of the Council—dealing with the prices charged for electricity in the City were read. These were as follows:

Lime Street.—That the prices charged for electricity in the City of London are excessive as compared with the cost in neighbouring boroughs, and that some reduction, especially in the secondary rate for lighting, should be made as from the beginning of the present quarter.

Similar resolutions were read regarding the wards of Farringdon Within, Billingsgate, Bridge, Cordwainer, Castle Baynard, and Candlewick.

Aldersgate.—That this wardmote suggest that, in view of the present excessive charges for electric light, the Corporation should consider the advisability of promoting a short Act of Parliament to enable the Stepney Borough Council or other lighting authority to bring their mains into the city.

Cripplegate Within.—That the Corporation be requested to take compulsory powers to supply electric light and power to the city.

Cripplegate Without.—That this wardmote suggest that, in view of the present excessive charges for electric light, the Corporation should consider the advisability of promoting a short Act of Parliament to enable some other body to bring its mains into the city.

On the motion of Mr. Deputy SANDLE, the various resolutions were referred to the Special Committee who are considering the matter.

Letters were read from the Secretary of the City of London Electric Lighting Company, Ltd., and the Charing Cross Electricity Supply Company, Ltd., setting out the scale of tariff charges under the London Electricity Supply (No. 1) Act, 1925, operating as from the 1st inst.—viz:

Lighting.—In each of the winter quarters, 6d. per unit for the first seven units per 30 watts connected; and in each of the summer quarters 6d. per unit for the first three units per 30 watts connected, and 2½d. per unit for all energy consumed in excess of such quantities.

Power.—* 2d. per unit, net.

Heating.—1½d. per unit, net.

* In the case of the City of London Electric Lighting Company, Ltd., the charge for power differs, being 1d. per unit consumed, *plus* a fixed charge at the rate of 10s. per quarter per kilowatt of connected demand.

Mr. Deputy SANDLE moved that the prices be referred to the Special Committee for consideration and report. On behalf of the consumers (said the Deputy), the long overdue announcement by the Companies of a reduction in the secondary prices could only be looked upon as an instalment on account; current could be obtained in neighbouring boroughs at far better terms than in the City of London. So long as the Companies continued to make extravagant profits, city traders would not relax their efforts to obtain supplies at lower rates. Either the maximum price of 6d., or, alternatively, the amount of units per kilowatt lamp chargeable at the maximum price should be considerably reduced without delay.

Mr. ARTHUR PRAGNELL said that, as a Director of a long-suffering Company, he desired to second the motion. The Court agreed to the motion unanimously.

Ewart & Son, Ltd.—The report of the Directors for the past year (which will be submitted at the 25th annual general meeting to be held at Winchester House on Feb. 2) states that, notwithstanding the generally adverse conditions, the trading of the Company has been maintained. The net profit for 1925, as shown in the accounts, amounts to £53,396, to which has to be added a sum of £2046 brought forward, making a total of £55,442. The Directors recommend the payment of a final dividend of 25 p.ct. on the ordinary shares (less income-tax), making with the interim dividend of 16 p.ct. already paid 41 p.ct. for the year; and a dividend on the management shares of a like amount. This will leave £6746 to be carried forward to next year's accounts.

CONTRACTS OPEN.

Retorts.

Tenders are invited by the Gas Committee of the Loughborough Corporation for the renewal of two through beds of retorts. [See advert. on p. 227.]

Cast-Iron Pipes and Specials.

The Gas Department of the County Borough of Burnley are inviting tenders for the supply of cast-iron pipes and specials. [See advert. on p. 227.]

Water Gas Plant.

The Clacton Urban District Council are inviting tenders for the manufacture and erection of a carburetted water gas plant. [See advert. on p. 227.]

Ammonia Recovery Plant.

Tenders are invited by the Gas Committee of the Manchester Corporation for the construction and erection of a semi-direct ammonia recovery plant. [See advert. on p. 227.]

TRADE NOTES.

J. & W. B. Smith, Ltd.

This firm have published a new catalogue of their glassware, burners, lamps, and accessories for incandescent lighting.

Renold Standard Chain Drives.

A booklet describing their standard chain drives has been published by Messrs. Hans Renold, Ltd., Burnage Works, Didsbury, Manchester. The development of this new series is a direct result of the demand created by the recent introduction of standard drives up to 10 H.P. The firm now offer a complete range of bush roller and inverted tooth types up to 50 H.P.

"T.I.C." Tar Plants.

On the recommendation of their Engineer and Manager (Mr. W. W. Townsend), the Colchester Gas Company have placed an order with the Woodall-Duckham Companies for a "T.I.C." (lead bath) tar plant having a capacity of 20 tons of crude tar per 24 hours. This plant is capable of producing tar to the Road Board Specification, with suitable blending when found necessary.

Liquid Purification.

The Compagnie de Vicoigne Noeux et Drocourt (Pas de Calais) have placed an order for a liquid purification plant with sulphur recovery, to deal with 2,570,000 c.ft. of coke-oven gas per day. The plant is guaranteed to give 90 p.ct. extraction of H_2S. It will be the latest American Koppers process, which is handled in this country by the Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd.

Woodall-Duckham Installations in France.

The Société Générale de Construction de Fours (the French licencees for the Woodall-Duckham vertical retort system) inform us that the Colmar Gas-Works have placed an order with them for six settings of two 5-ton Woodall-Duckham retorts. They have received orders for the installation of Woodall-Duckham retorts at Montbeliard and Rennes. That at Montbeliard is the second installation on these works, and consists of two settings of four 5-ton retorts, which are nearing completion. The installation at the Rennes Gas-Works, which has recently been put to work, consists of five settings of two 7-ton Woodall-Duckham retorts; 7 to 7½ tons of Durham (Ryhope) coal are being successfully carbonized per 24 hours. The coal contained at least 70 p.ct. of slack.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 20.]

Nos. 730-1330.

BELL, N. M.—"Gas fires." No. 1068.
BOYD, R. R.—"Gas stoves." No. 1258.
COLLIN & CO.—"Cooling coke, and utilization of heat therefrom." No. 1149.
DAVIS, W. J.—"Gas meters." No. 868.
DEMPSTER, C., and DEMPSTER, LTD., R. & J.—"Telescopic gasholders." No. 1160.
DEMPSTER, LTD., R. & J.—"Telescopic gasholders. No. 1266.
DEMPSTER & SONS, LTD., R.—"Apparatus for removing and quenching hot coke discharged from retorts, &c." No. 958.
DICKSON, W. K. L.—See Boyd, R. R. No. 1258.
GAS METER COMPANY, LTD.—"Electric gas lighting apparatus." No. 1134.
GAS RESEARCH COMPANY.—"Transferring heat." No. 932.
HANSFORD, J.—"Fluid meters." No. 1235.
KING, W. E.—See Gas Meter Company, Ltd. No. 1134.
PARSONS, W. B.—"Gas rings, &c." No. 827.
RAINCHON, L.—"Gas producing furnaces." No. 1183.
REBER, J. W.—"Recovery of waste heat." No. 1027.
SCHAEFER, J.—See Collin & Co. No. 1149.
SCOTT, J. W.—See Dempster, Ltd., R. & J. No. 1266.
TOOGOOD, H. J.—See Dempster & Sons, Ltd., R. No. 958.
TURNER, E., and TURNER & CO., E.—"Gas burners." No. 1281.
TWIGG, C. H.—"Incandescent gas burners." No. 959.
WHITE, A. E.—See Gas Research Company. No. 932.
WOODALL-DUCKHAM (1920), LTD.—See Reber, J. W. No. 1027.

Bindulators, Ltd., is the title of a newly-registered Company, formed to carry on the business of tar distillers or manufacturers, &c., with a nominal capital of £1250, in £1 shares.

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NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market opened last week with almost a burst of strength, and steady demand throughout the period served to give a feeling of considerable confidence, and to carry prices further ahead. Turns for next month have been freely booked, and current prices are firmly quoted over the next month or two. Collieries are convinced that, while the outlook remains unsettled, demand is more likely to grow than to decrease, and that some, at any rate, of the present keen demand may be due to stocking.

Gas coals are especially well sold over next month, and prices have advanced all round. Wear Specials are quoted at 18s. f.o.b., and best qualities (Holmside class) up to 17s. 6d. Seconds are in good request at 16s. to 16s. 6d.—a considerable change from the "slump" prices of a month or two ago.

Uncertainty as to the course of events after the present subsidy period is, of course, still hampering contract business; but the present situation, with full-time working at improving prices, is satisfactory as far as it goes.

The pressure for gas coke is still unchecked, and 24s. 6d. to 25s. 6d. f.o.b. is obtainable, according to quality.

Durham unscreened coking coals are 16s. to 16s. 6d. f.o.b., and a good market, while best unscreened bunkers are up to 17s.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

House coals in Yorkshire and Lancashire are in good demand. There are indications that the Metropolitan area is rather short of supplies. Prices locally are steady, and collieries report full order-books for all descriptions of screened coal.

The industrial situation has not altered for some weeks, and there is no new business in the market. The better grade fuels have, however, advanced in price, probably owing to the fact that export prices are now competing with inland figures.

Gas coals are steady, with indications that renewals of contracts will be made at prices in advance of those obtained last year.

Export is spasmodic, with Best South Yorkshire hards and washed doubles demanding better figures than they did a month ago.

The following are the Humber bunker and export prices (f.o.b. usual shipping ports): South Yorkshire—Hards, Association, 22s. to 23s. 6d.; screened gas coal, 20s. 6d. to 21s.; washed doubles, 20s. to 20s. 9d.; washed singles, 18s. to 18s. 6d.; washed smalls, 14s. 3d. to 14s. 9d.; rough slack, 10s. 3d. to 10s. 6d.; smithy peas, 19s. 6d. to 21s. 6d. West Yorkshire—Hartleys (f.o.b. Goole), 18s. 6d.; washed doubles, 19s. to 19s. 6d.; washed singles, 17s. 6d.; washed smalls, 13s. 6d. to 14s.; unwashed doubles, 14s. 6d. to 16s. 6d.; coking smalls, 10s. to 10s. 6d. Derbyshire and Nottinghamshire—Top hards, 21s. 6d. to 23s. 6d.; washed smalls, 13s. 6d. to 13s. 9d.; rough slack, 10s. 3d. to 10s. 6d. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 18s. to 20s.; gas coke, 24s. 6d. to 26s.; furnace coke, 20s. 6d. to 21s. 6d. per ton.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

Further small advances have been made in pithead prices, for the most part by collieries which had lagged behind in the revision of lists at the opening of the year. Industrial coal is unaffected. It remains at the level which prevailed prior to Christmas, nor is there any additional pressure of demand to stimulate values. Slacks are firm; but business can be placed round about 8s. Frost and snow have aggravated the stringency in the house coal department. There are heavy arrears to be overtaken. A slight tightening-up of selling prices here and there is the only reflection in the retail trade of re-adjustments in the pithead rates. Best deep coals, which appreciated sharply at the turn of the year, have not been further advanced. Quotations for blast-furnace coke remain about 1s. 6d. above the basis fixed for last quarter.

Smelters are getting some indemnification in higher prices for pig iron. The upward movement is resisted by consumers, but an appreciable proportion of the new quarter's output of pig is already pledged, and the fuel position is such a restraint on the re-starting of more furnaces that consumers pay rather than risk being overtaken by a shortage. Complaints as to inefficient railway transport continue to be ventilated. More wharfage accommodation and improved marshalling of trains at junctions in the coalfields are advocated.

Opposition to Gas Light and Coke Company's Bill.

In the report of the Parliamentary Committee of the London County Council for the meeting on the 26th inst. reference is made to the Gas Light and Coke Company's Bill. This Bill seeks, *inter alia*, to confer additional borrowing powers upon the Company and to enable them to pay a minimum dividend of 5 p.ct. on the ordinary stock, whether or not, under the operation of the sliding-scale, the selling price of the gas warrants the payment of such a dividend. As regards borrowing powers, the Company seek authority to raise loan capital up to a maximum of one-half of the ordinary and preference capital issued from time to time, the effect of which would be to enable them to increase their loan capital by £4,253,819, thus making the total unexercised capital power £6,557,860. The question of opposing the Bill will be considered by the Council at the meeting to be held on Feb. 2.

Ellesmere Port Gas Undertaking.—A Ministry of Health inquiry was held last Friday into an application by the Ellesmere Port Council for sanction to borrow £29,000 for gas-works extensions.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *Jan.* 25.

Pitch continues steady at about 57s. 6d. per ton f.o.b. It is stated that a moderate amount of business is being done for next season's shipment at slightly below this level.

Creosote is firm at about 7⅞d. per gallon net in bulk at makers' works.

Pure benzole and pure toluole are unchanged at about 2s. 2d. per gallon, and 95/160 solvent naphtha at 1s. 10d. per gallon.

Pyridine, 90/140, is steady at about 19s. 6d. per gallon.

Tar Products in the Provinces.

Jan. 25.

Markets for tar products remain practically stationary.

Sales of pitch are reported at prices varying from 55s. to 57s. 6d. There is a little demand from the Continent; but buyers appear to be well supplied and not inclined to book any considerable quantity at market prices.

Creosote is still firm, both for home and export.

Water-white products remain steady with a fair demand for delivery to the end of June next, with the exception of heavy naphtha, which is still very dull. Cresylic acid remains firm, while there has been a slight improvement in the market for crude carbolic acid. Naphthalene and anthracene continue neglected.

The average values for gas-works products during the week were: Gas-works coal tar, 39s. to 44s. Pitch, East Coast, 56s. to 58s. f.o.b. West Coast—Manchester, 50s. to 52s. 6d.; Liverpool, 51s. to 53s.; Clyde, 54s. to 55s. Benzole, 90 p.ct. North, 1s. 8½d. to 1s. 9½d.; crude, 65 p.ct., at 120° C., 1s. 1d. to 1s. 2d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 8½d. to 1s. 9½d. Toluole, naked, North, 1s. 8d. to 1s. 9d., nominal. Coal-tar crude naphtha, in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 1s. 7½d. to 1s. 8½d. Heavy naphtha, North, 11½d. to 1s. 0½d. Creosote, in bulk, North, liquid, 6½d. to 6¾d.; salty, 6d. to 6¼d.; Scotland, 5¾d. to 6d. Heavy oils, in bulk, North, 6¾d. to 7d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Five Years' Achievement.

Large and powerful industrial concerns of to-day justly pride themselves on the great number of years they have been established. It is astonishing, however, what can be accomplished in five years by energy and enterprise. In 1920, Stoves Ltd. commenced the manufacture of gas appliances in a small building at Mottram's Yard, Warrington. In twelve months this small works became inadequate, and a larger building was purchased at Scotland Road, where the well-known "Bakerloo" cooker was first produced. As a result of the support received from the gas industry, further expansion became necessary in less than four years. An opportunity occurred at this time of acquiring a large Government works built in 1916, at Rainhill, near Liverpool, and arrangements were made to take it over in December last. Considerable difficulties remained to be overcome before the whole of the organization could be transferred, but all the departments have now been laid out on mass production lines. All the shops are on the ground-floor level; and the iron, delivered in trucks to the main siding, can be cast in the foundry at one end of the works, and after it has passed through each department in turn, a finished cooker or other article is loaded up in trucks at the other end.

Elstree and Boreham Wood Debentures.—The tenders for the £8000 of 6 p.ct. redeemable debenture bonds which Messrs. A. & W. Richards offered on behalf of the Directors of the Elstree and Boreham Wood Gas Company, Ltd., amounted to £23,450, and ranged from £102 down to the minimum of par.

Coke Ovens for Gas-Works.—Repeat orders have been placed by the Rochester Gas and Electric Corporation and the Utica Gas and Electric Company, Utica, N.Y., for additional batteries of coke ovens. These are of the Becker type. A further order has been placed by the Weirton Steel Company for a battery of 40 Becker ovens.

South Suburban Gas Company's Standard Price.—The report of the Public Control Committee of the London County Council [see *ante*, p. 163] recommending that the application of the South Suburban Gas Company for a Special Order be opposed—one of the grounds being that the conditions now prevailing do not justify so high a standard price as that proposed—was received and adopted by the Council without comment, at their meeting on the 19th inst.

The Oswaldtwistle Gas Committee have decided to introduce the therm system as from March 8. The price fixed is 7½d. per therm, with a discount of ½d. for prompt payment. The declared calorific value of the gas supplied for that price is 480 B.Th.U.

In a recent issue, we intimated that second installations of vertical retorts on the Woodall-Duckham system are to be erected at Meriden and Holyoke, U.S.A. These are to be erected by the Isbell Porter Company, of Newark, New Jersey, the licencees for the Woodall-Duckham system.

On Jan. 21, Dr. C. M. Walter (Industrial Research Laboratories, Birmingham) delivered an address to the Birmingham Branch of the Association of Drop Forgers. The use of town gas at present prices in Birmingham, he said, made it possible, taking everything into account, to deal with such work as heating steel for forging at a cost favourable in comparison with the cost of using solid fuel.

STOCK MARKET REPORT.

CONDITIONS on the Stock Exchange were quiet last week. The decision of the railwaymen, not to accept the award of the National Wages Board, caused a slight fall in Home Railway Stocks, but later views indicating the possibility of a satisfactory settlement brought about a recovery. Gilt-edged investments also firmed up at the close.

The widespread publicity given to the electrical schemes of the Government has been an excellent advertisement for that industry, and electrical manufacturing shares enjoyed a miniature boom. Advances also occurred in electric light companies' shares; but there was a reaction towards the close of the week. As very few details of the proposed Bill, which will not make its appearance for some weeks, are known, speculation in the shares is attended with some risk. The activity, however, is having a depressing effect on Gas Shares; and it will be seen that business in the stocks of the leading Companies is being done at lower prices than have prevailed during the past few weeks. The quotations of the ordinary of the "Premier" Company were marked down 3½ points, to 83—86; and the British ordinary 2 points, to 103—108.

The three Metropolitan Companies have announced their dividends for the past half-year. The Gas Light and Coke Company are recommending the payment of a dividend of £4 17s. 4d. p.c.t. per annum; the South Metropolitan Gas Company £6 p.c.t. per annum; and the Commercial Gas Company £5 6s. 8d. p.c.t. per annum on the 4 p.c.t. stock, and £5 3s. 4d. p.c.t. per annum on the 3½ p.c.t. stock. The first two companies report a reduction in the amount carried forward; but the Commercial Company accounts show no shortage on the year's trading.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 71¾, Bombay 18s. 9d., British 105, Cape Town 7, Commercial 4 p.c.t. 83, 83¼, Gas Light and Coke 85⅞, 85⅞, 86, 86⅛, 86¼, 86⅜, 86⅜, 87, 3½ p.c.t. maximum 60½, 4 p.c.t. preference 77¼, 78, 3 p.c.t. debenture 58¼, 58½, 59, Hastings and St. Leonards 3½ p.c.t. 73½, Imperial Continental 136½, Primitiva 12s. 4½d., 12s. 6d., 12s. 9d., 12s. 10½d., South Metropolitan 94½, 94¾, South Suburban 5 p.c.t. 100½, Tuscan 20s., 6 p.c.t. debenture 74, Uxbridge 5 p.c.t. Maidenhead 91, 92.

On Tuesday, Bombay 18s. 3d., 18s. 6d., 18s. 9d., Brighton and Hove original 173½, 174, British 105, Cape Town 4½ p.c.t. preference 6⅞, Gas Light and Coke 84, 85, 85⅛, 85½, 3½ p.c.t. maximum 59, 3 p.c.t. debenture 58½, 59, 59⅛, 59¼, Imperial Continental 135½, 136, Primitiva 12s., 12s. 1½d., 12s. 3d., South Metropolitan 94, South Suburban 5 p.c.t. debenture 96¼, Tuscan 24s. 6d. Supplementary prices, Grays and Tilbury "B" 8 1/16, 8⅛, South Suburban 7 p.c.t. debenture 102½, Southend-on-Sea 5 p.c.t. new "B" 82.

On Wednesday, Alliance and Dublin 71⅛, Bombay 18s. 6d., 18s. 9d., Brighton and Hove "A" 140, British 105, Croydon maximum dividend 83¾, Gas Light and Coke 83, 83⅛, 83¼, 83½, 84, 84¼, 84⅛, 4 p.c.t. preference 78½, 3 p.c.t. debenture 58½, 59, 59½, Imperial Continental 136¼, Primitiva 12s. 1½d., 12s. 9d., South Metropolitan 93½, 94, 94½, 6¼ p.c.t. debenture 105, South Suburban 5 p.c.t. debenture 95¼, Uxbridge 5 p.c.t. Maidenhead 91¼, 92. Supplementary prices, Grays and Tilbury "B" 8 1/16, 8⅛.

On Thursday, Bombay 18s. 3d., 18s. 9d., British 105, Commercial 4 p.c.t. 82, 83¼, Continental Union 34½, European 6, Gas Light and Coke 82½, 82⅝, 83, 84, 4 p.c.t. preference 78½, 3 p.c.t. debenture 58¼, 59, Imperial Continental 135½, 136½, Primitiva 12s., 12s. 3d., South Metropolitan 93½, 94, 95⅛, South Suburban 5 p.c.t. 100, Tottenham "A" 110¼. Supplementary prices, Exeter 7 p.c.t. new ordinary 12 1/16, Grays and Tilbury "B" 8⅛.

On Friday, Croydon sliding-scale 99½, Gas Light and Coke 82, 82¼, 82½, 82⅝, 83, 3½ p.c.t. maximum 60, 4 p.c.t. preference 77½, 78, 3 p.c.t. debenture 58¼, Imperial Continental 135½, 136¼, 136½, Liverpool 7 p.c.t. preference 102½, South Metropolitan 94½, South Suburban 5 p.c.t. 100½, Tottenham "B" 91, Uxbridge 5 p.c.t. Maidenhead stock 92. Supplementary prices, British (Norwich) 3½ p.c.t. mort. debentures 62, Liverpool 5 p.c.t. 84⅛, Pinner new 6 p.c.t. preference 5⅛, Rochester, Chatham, and Gillingham 83.

In the Money Market the Treasury Bill allotment came as a great surprise. In spite of a fall in the average rate at which Bills were issued, only five-sixths of the amount applied for was accepted; £5,000,000 being withheld. The rate was £4 15s. 0·19d. p.c.t.; or 1s. 7·66d. p.c.t. less than the previous week. Money was in good demand, and as high as 4½ p.c.t. was paid for overnight accommodation.

The Foreign Exchanges remained quiet. In spite of the opposition on the Paris Bourse to the proposed taxes on shares, the French franc was firmer, and at one time on Friday fell to 129f. 50c., the closing price being 129f. 75c. Sterling on New York moved within narrow limits, and there was a slight rise at the close to $4.86¼. Belgian and Italian currencies were slightly dearer.

There was little change in Gold movements; but a consignment of £500,000 is expected from South Africa this week. The price nominally remains at 84s. 10½d. per oz. Silver was firmer, the price rising to 30⅞.

The Bank Rate is 5 p.c.t., to which it was raised from 4 p.c.t. on Dec. 3. Bankers' deposit rates are 3 p.c.t. The deposit rates of the discount houses are 3 p.c.t. at call and 3½ p.c.t. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Jan. 22.	Rise or Fall.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 13	5	5	Aldershot 5 p.c. max. C.	75—78	..	..
322,992	,,	,,	4	4	Do. 4 p.c. Pref.	70—75	..	..
1,551,868	,,	Oct. 8	6¼	6¼	Alliance & Dublin Ord.	69—73	+1	71¼—71¾
374,000	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	58—63	..	..
300,000	1	Oct. 22	1/7½	1/7½	Bombay, Ltd.	7/8—1	..	18/3—18/9
170,000	10	Aug. 13	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	Jan. 7	3	3	Do. 3 p.c. Deb.	55—58	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
214,740	,,	Aug. 27	12½	12	Brighton & Hove Orig.	172—177	..	173½—174
244,200	,,	,,	9½	9	Do. A Ord.	137—142	..	140
1,287,500	,,	July 23	5	5	Bristol 5 p.c. max.	89—91*a*	..	..
855,000	,,	Oct. 8	7	8	British Ord.	103—108	−2	105
100,000	,,	Jan. 7	7	7	Do. 7 p.c. Pref.	117—122	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	69—74	..	..
100,000	10	Dec. 17	8	6	Cape Town, Ltd.	6¼—7⅛	..	7
100,000	10	Nov. 5	4½	4½	Do. 4½ p.c. Pref.	6—7	..	6¾
150,000	Stk.	Jan. 7	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
626,860	,,	July 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,860	,,	Jan. 7	7½	7½	Do. 7½ p.c. Red. Deb.	98—101	..	..
157,150	,,	Aug. 13	6¼	5	Chester 5 p.c. Ord.	90—95*b*	..	..
79,185	1	Oct. 8	—	2/-	Colombo Ltd. Ord.	25/—27/-	..	..
24,500	1	,,	—	1/4½	Do. 7 p.c. Pref.	21/—23/-	..	..
1,513,280	Stk.	July 23	5/14.8	5½	Commercial 4 p.c. Cap.	82—87	..	82—83½
560,000	,,	,,	5⅝	5/3/4	Do. 3½ p.c. Cap.	82—87	..	..
475,000	,,	Dec. 17	3	3	Do. 3 p.c. Deb.	55—58	..	..
800,000	,,	Oct. 8	—	4	Continental Union, Ltd.	35—40	..	34½
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	88—91	..	..
660,000	,,	Aug. 13	6½	6½	Croydon sliding scale	97—101	..	99½
284,975	,,	,,	5	5	Do. max. div.	81—84	..	83½
492,270	,,	Aug. 13	9	6	Derby Con.	107—109*c*	..	..
55,000	,,	Dec. 17	4	4	Do. Deb.	74—76*c*	..	..
209,000	,,	Sept. 10	5	5	East Hull Ord. 5 p.c.	88—91	..	..
50,000	,,	Dec. 17	—	5	Eastbourne 5 p.c. Deb.	93—98	..	..
1,002,180	10	July 23	4	6	European, Ltd.	5½—6⅝	..	6
16,460,070	Stk.	Aug. 13	5⅛	5⅛	Gas Light & Coke 4 p.c. Ord.	82—84	−3½	82—87
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	60—63	..	59—60½
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	77¼—78½
4,761,930	,,	Dec. 17	3	3	Do. 3 p.c. Con. Deb.	58—61	..	58¼—59½
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7⅛	7⅛	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Sept. 10	6⅝	6⅝	Hastings & St L. 5 p.c. Conv.	90—95	..	..
258,740	,,	,,	5⅛	5⅛	Do. 3½ p.c. Conv.	71—76	..	73⅜
70,000	10	Sept. 24	10	10	Hongkong & China, Ltd.	19½—20½	..	..
86,600	Stk.	Aug. 13	10	10	Hornsey 7 p.c.	132—137	..	..
1,976,000	,,	Nov. 19	59	10	Imperial Continental Cap.	133—138	..	135½—136½
226,170	,,	Aug. 13	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	..	..
235,242	,,	Aug. 13	6½	6½	Lea Bridge 5 p.c. Ord.	97—102	..	..
2,127,340	,,	Aug. 13	5½	5½	Liverpool 5 p.c. Ord.	85—85½*b*	+1	84¼—84¾
600,000	,,	Sept. 24	7	7	Do. 7 p.c. Red. Pref.	103—105*b*	..	102½
165,736	,,	Aug. 27	8	9	Maidstone 5 p.c. Cap.	118—128	..	..
63,480	,,	Dec. 17	3	3⅝	Do. 3 p.c. Deb.	54—59	..	..
75,000	5	Dec. 3	7	6	Malta & Mediterranean	4½—5	..	..
541,920	Stk.	Nov. 19	4	4	Montevideo, Ltd.	69—73	..	..
2,061,315	,,	Aug. 13	5	5	Newcastle & Gateshead Con.	71½—72	+1½	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.	75½—76¼*d*	..	..
529,705	,,	Dec. 17	3½	3½	Do. 3½ p.c. Deb.	66⅝—67½*d*	..	..
15,000	,,	Aug. 27	12	11½	North Middlesex 10 p.c.	160—170	..	..
75,940	,,	,,	8⅝	8⅝	Do. 7 p.c.	115—120	..	..
300,000	Stk.	Dec. 3	7	9	Oriental, Ltd.	98—103	..	..
188,120	,,	Jan. 7	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	110—115	..	..
60,000	50	Aug. 27	14	14	Portsea Island B	93—96	..	..
100,000	50	,,	13	13	Do. C	90—95	..	..
2,289,909	1	—	—	—	Primitiva Ord.	12/0—13/0	-/6	12/—12/10½
302,600	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	82—84	..	..
600,000	Stk.	Jan. 21	4	4	Do. 4 p.c. Red. Deb. 1911	63—65*	−1	..
193,744	,,	Dec. 17	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	+1	..
264,496	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	+1	..
150,000	10	Sept. 24	6	6	San Paulo 6 p.c. Pref.	7½—8	..	..
125,000	50	Jan. 4	5	5	Do. 5 p.c. Red. Deb.	41—44	+1	..
270,000	Stk.	Aug. 27	5⅜	5⅜	Sheffield A	99—101*e*	..	..
419,968	,,	,,	5⅜	5⅜	Do. B	99—100*e*	..	..
1,047,000	,,	,,	5¼	5¼	Do. C	99—100*e*	..	..
90,000	10	June 11	6	4	South African	5—7	..	..
6,669,895	Stk.	Aug. 13	6½	5	South Met. Ord.	93—96	−⅛	93¼—94¾
1,895,445	,,	Jan. 7	3	3	Do. 3 p.c. Deb.	56—59	..	..
734,000	,,	Sept. 10	6½	6½	Do. 6½ p.c. Red. Db.	103—105	..	105
91,500	,,	Aug. 13	8¾	8⅞	South Shields Con.	124—126*d*	..	..
1,187,795	,,	July 23	6½	6⅝	South Suburban Ord. 5 p.c.	99—103	..	100—100½
368,837	,,	Dec. 17	5	5	Do. 5 p.c. Deb.	94—97	..	95½—96½
647,740	,,	Oct. 22	5	5	South'mpton Ord. 5 p.c. max.	78—81	..	..
121,275	,,	Jan. 7	4	4	Do. 4 p.c. Deb.	69—74	..	..
250,000	,,	Aug. 27	7	7	Swansea 7 p.c. Red. Pref.	101—103	..	..
200,000	,,	Dec. 17	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
120,000	,,	July 23	8	7½	Tottenham District A 5 p.c.	110—115	..	110½
882,275	,,	,,	6½	5⅞	Do. B 3½ p.c.	88—93	..	91
150,000	,,	July 9	—	28/4	Do. 5½ p.c. Pref.	103—105	..	..
181,255	,,	Dec. 17	4	4	Do. 4 p.c. Deb.	74—77	..	..
258,251	,,	Aug. 27	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, & Wycombe 5 p.c.	70½—71*d*	..	..
197,294	,,	Aug. 27	6⅞	6⅞	Do. 5 p.c. Pref.	93—98	..	..
88,330	,,	,,	5	5	Do. 5 p.c. Maidenh'd	93—98	..	..
91,800	,,	,,	6⅞	6⅞	Wandsworth, Wimbledon, and Epsom—	88—93	..	91—92
30,000	,,	July 9	9½	8½	Wandsworth A 5 p.c.	128—133	..	..
255,636	,,	,,	7⅞	7	Do. B 3½ p.c.	109—114	..	..
392,955	,,	,,	6/9/6	5/19/0	Do. C and New Wimbledon 5 p.c.	92—97	..	..
352,000	,,	,,	7⅜	6⅝	Epsom 5 p.c.	103—108	..	..
98,000	,,	,,	7⅞	7⅛	3 p.c. Deb.	113—118	..	..
88,416	,,	Jan. 7	3	3		55—58	..	..

Quotations at:—*a*.—Bristol. *b*.—Liverpool. *c*.—Nottingham. *d*.—Newcastle. *e*.—Sheffield. *Ex. div.

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(Signed) H. BATEMAN,
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(GAS DEPARTMENT.)

RENEWAL OF RETORTS.

TENDERS are invited by the Gas Committee, which must be in by Wednesday, Feb. 10, for the RENEWAL of Two Through Beds of RETORTS.
Further Particulars may be obtained from
EDWARD ONIONS,
Engineer and Manager.

MANCHESTER CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the Construction and Erection of a SEMI-DIRECT AMMONIA RECOVERY PLANT on the Site of the new Gas-Works at Partington.
Specification and Form of Tender may be had on Application to Mr. J. H. Sillitoe, Secretary, Gas Department, Town Hall, Manchester, on payment of Two Guineas, which will be returned on receipt of a *bona-fide* Tender. Blue prints of the Drawings may also be had on payment of One Guinea, which will not be returned.
General Plan of the Works may be inspected, permission to view the site, and any other Information obtained, on application to Mr. William Newbigging, Engineer, at his office, No. 5, Norfolk Street, Manchester.
Sealed Tenders, in official envelope, addressed to the Chairman of the Gas Committee and endorsed "Semi-Direct Ammonia Recovery Plant, Partington Station," must be Delivered at the Gas Offices, Town Hall, Manchester, not later than 5 o'clock p.m. on Thursday, the 18th of February, 1926.
The Gas Committee do not bind themselves to accept the lowest or any Tender.
By order,
P. M. HEATH,
Town Clerk.
Town Hall,
Manchester,
January, 1926.

CLACTON URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

TO WATER-GAS PLANT MAKERS.

THE above Council are prepared to receive TENDERS for the manufacture and Erection of a 300,000 cubic feet per day CARBURETTED WATER-GAS PLANT.
Drawing, Specification, and Form of Tender may be obtained by Water-Gas Plant Makers on Application to Mr. Sydney Francis, A.M.I Mech.E., Engineer and Manager, Gas Offices, Station Road, Clacton-on-Sea.
Tenders, sealed and endorsed "Water-Gas Plant," to be Delivered to the undersigned not later than 12 o'clock noon on Wednesday, Feb. 3, 1926.
The Council do not bind themselves to accept the lowest or any Tender.
GEO. T. LEWIS,
Clerk to the Council.
Council Offices,
Station Road,
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COUNTY BOROUGH OF BURNLEY.
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Sealed Tenders, endorsed "Cast-Iron Gas Pipes," and addressed to the Chairman of the Gas Committee, Gas Works, Burnley, must be Delivered not later than Monday morning, the 8th of February, 1926.
J. HERBERT CLEGG, F.C.S.,
Engineer and Manager.
Gas-Works,
Parker Lane,
Burnley,
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